Species at Risk Act
Management Plan Series
Adopted under Section 69 of SARA

Management Plan for the Barren-ground Caribou (*Rangifer tarandus groenlandicus*), Dolphin and Union population, in Canada:

Adoption of the Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut

Barren-ground Caribou, Dolphin and Union population

2018

Government of Canada
Gouvernement du Canada
Canada

Recommended citation:

Environment and Climate Change Canada. 2018. Management Plan for the Barren-ground Caribou (*Rangifer tarandus groenlandicus*), Dolphin and Union population, in Canada: Adoption of the Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut . *Species at Risk Act* Management Plan Series. Environment and Climate Change Canada, Ottawa. 2 parts, 3 pp. + 107 pp.

For copies of the management plan or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry[1].

Cover photo: © Kim Poole

Également disponible en français sous le titre
«Plan de gestion du caribou de la toundra (*Rangifer tarandus groenlandicus*) population Dolphin-et-Union au Canada : adoption du Plan de gestion du caribou de Dolphin-et-Union (*Rangifer tarandus groenlandicus x pearyi*) dans les Territoires du Nord-Ouest et au Nunavut »

© Her Majesty the Queen in Right of Canada, represented by the Minister of Environment and Climate Change, 2018. All rights reserved.
ISBN 978-0-660-26016-7
Catalogue no. En3-5/95-2018E-PDF

[1] http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1

MANAGEMENT PLAN FOR THE BARREN-GROUND CARIBOU (*Rangifer tarandus groenlandicus*), DOLPHIN AND UNION POPULATION, IN CANADA

2018

Under the Accord for the Protection of Species at Risk (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada.

In the spirit of cooperation of th[illegible]ccord, the *Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut* was prepared jointly by the Government of Nunavut and the Government of the Northwest Territories, in cooperation with the Government of Canada and co-management partners. The Government of Canada adopts this management plan (Part 2) under section 69 of the *Species at Risk Act* (SARA). Environment and Climate Change Canada has included a federal addition (Part 1) which completes the SARA requirements for a management plan.

The federal management plan for the Barren-ground Caribou (*Rangifer tarandus groenlandicus*), Dolphin and Union population[2], in Canada consists of two parts:

Part 1 – Federal Addition to the *Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut*, prepared by Environment and Climate Change Canada.

Part 2 – *Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut*, prepared by the Government of the Northwest Territories – Department of Environment and Natural Resources and the Government of Nunavut – Department of Environment, in cooperation with the Government of Canada – Environment and Climate Change Canada.

[2] At the time of document publication, the species is listed on Schedule 1 of the *Species at Risk Act* as Barren-ground Caribou (*Rangifer tarandus groenlandicus*), Dolphin and Union population. It is currently referred to as the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus*) by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2011) and is referred to as the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) by the Northwest Territories. All three names refer to the same population.

Table of Contents

Part 1 – Federal Addition to the *Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut*, Prepared by Environment and Climate Change Canada.

Preface 2

Additions and Modifications to the Adopted Document 3

Part 2 – *Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut*, prepared by the Government of the Northwest Territories – Department of Environment and Natural Resources and the Government of Nunavut – Department of Environment, in cooperation with the Government of Canada – Environment and Climate Change Canada.

Part 1 – Federal Addition to the *Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut*, prepared by Environment and Climate Change Canada

Preface

The federal, provincial, and territorial government signatories under the National Accord for the Protection of Species at Risk (1996)[3] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of management plans for listed species of special concern and are required to report on progress within five years after the publication of the final document on the SAR Public Registry.

The Minister of Environment and Climate Change and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Barren-ground Caribou, Dolphin and Union population, and has prepared the federal component of this management plan (Part 1), as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the Government of the Northwest Territories, the Government of Nunavut, the Wildlife Management Advisory Council (NWT), and the Nunavut Wildlife Management Board, as per section 66(1) of SARA. SARA section 69 allows the Minister to adopt all or part of an existing plan for the species if the Minister is of the opinion that an existing plan relating to wildlife species includes adequate measures for the conservation of the species. The Government of Nunavut, Government of the Northwest Territories and Government of Canada provided the attached management plan for the Dolphin and Union population of Barren-ground Caribou (Part 2) as a guide to the jurisdictions responsible for managing the species in the Northwest Territories and Nunavut. The management plan was prepared in cooperation with communities, hunters and trappers organizations/ committees, wildlife management boards, territorial governments, federal departments and organizations within the range of Barren-ground Caribou, Dolphin and Union population.

Success in the conservation of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this plan and will not be achieved by Environment and Climate Change Canada, the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this plan for the benefit of Barren-ground Caribou, Dolphin and Union population, and Canadian society as a whole.

Implementation of this management plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

[3] http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2

Additions and Modifications to the Adopted Document

This section has been included to address specific requirements of the federal *Species at Risk Act* (SARA) that are not addressed in the *Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut* (Part 2 of this document) and/or to provide updated or additional information.

Under SARA, prohibitions regarding the protection of species and their habitat do not apply to species of special concern. Conservation measures in the territorial management plan dealing with the protection of individuals and their habitat are still adopted to guide conservation efforts but would not result in federal legal protection.

The competent Ministers are not adopting section 6.6 "Managing Based on Population Status (Level)". The implementation of the management approaches for harvest is under the jurisdiction of the territorial governments and co-management boards.

Part 2 – *Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut*, prepared by the Government of the Northwest Territories – Department of Environment and Natural Resources, the Government of Nunavut – Department of Environment, in cooperation with the Government of Canada – Environment and Climate Change Canada

Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut

2018

Government of Northwest Territories

Nunavut Wildlife Management Board

WILDLIFE MANAGEMENT ADVISORY COUNCIL (NWT)

Nunavut

Copies of the management plan are available at www.nwtspeciesatrisk.ca and www.gov.nu.ca/environment

All rights reserved.

ISBN: 978-0-7708-0258-5

This management plan recognizes and respects the intellectual property rights of the *Inuit Qaujimajatuqangit* holders, traditional knowledge holders, elders, hunters and others who shared their knowledge to develop this document. The information shared by individuals at joint planning workshops and at hunters and trappers committee /organization meetings cannot be referenced in other documents without the expressed permission of the individual, hunters and trappers committee /organization or other organization that provided the information. This applies to comments cited from: Ulukhaktok Traditional Knowledge interviews 2011-2013; Tuktoyaktuk Community Meeting 2014; First Joint Meeting 2015; Second Joint Meeting 2016; Ekaluktutiak Hunters and Trappers Organization 2016; Kugluktuk Hunters and Trappers Organization 2016; Paulatuk Hunters and Trappers Committee 2016; and Olohaktomiut Hunters and Trappers Committee 2016.

Cover photo: Dolphin and Union Caribou at High Lake, Nunavut, April 2008. Credit: K. Poole.

PREFACE

The *Management Plan for the Dolphin and Union Caribou (Rangifer tarandus groenlandicus x pearyi) in the Northwest Territories and Nunavut* describes the management goals and objectives for Dolphin and Union Caribou and recommends approaches to achieve those objectives.

This plan was developed to meet the requirements for a Northwest Territories management plan under the territorial *Species at Risk (NWT) Act* as well as a national management plan under the federal *Species at Risk Act*, and to meet management needs in Nunavut. Development of the management plan respected co-management processes legislated by the *Inuvialuit Final Agreement* and the *Nunavut Land Claims Agreement*.

The management plan was prepared jointly by the Government of Nunavut and the Government of the Northwest Territories, in cooperation with the Government of Canada and co-management partners. Co-management partners involved in this process include: the Nunavut Wildlife Management Board, Kitikmeot Regional Wildlife Board, Nunavut Tunngavik Inc., Kitikmeot Inuit Association, Kugluktuk Hunters and Trappers Organization (HTO), Ekaluktutiak HTO, Omingmaktok HTO, Burnside HTO, Wildlife Management Advisory Council (NWT), Inuvialuit Game Council, Ulukhaktok Hunters and Trappers Committee (HTC), and the Paulatuk HTC.

Success in the management of this population depends on the commitment and collaboration of the many different constituencies that are involved in implementing the directions set out in this plan and will not be achieved by any group or jurisdiction alone. All Canadians are invited to join in supporting and implementing this plan for the benefit of the Dolphin and Union Caribou, and Canadian society as a whole.

This management plan does not commit any party to actions or resource expenditures; implementation of this plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

ACCEPTANCE STATEMENT

The following groups approved this *Management Plan for the Dolphin and Union Caribou (Rangifer tarandus groenlandicus x pearyi) in the Northwest Territories and Nunavut*, on the date listed:

Nunavut Wildlife Management Board: September 22, 2017

Government of Nunavut: September 27, 2017

The Government of the Northwest Territories and the Wildlife Management Advisory Council (NWT) adopted this management plan on December 7, 2017 through a Conference of Management Authorities consensus agreement under the *Species at Risk (NWT) Act*.

ACKNOWLEDGMENTS

Preparation of this document was funded by the Government of Canada (GC), Environment and Climate Change Canada; Government of Nunavut (GN), Department of Environment; and the Government of the Northwest Territories (GNWT), Department of Environment and Natural Resources. The principal writers of this document were Lisa Worthington, Species at Risk Recovery Planning Coordinator, GNWT; Amy Ganton, Species at Risk Biologist, GC; Lisa-Marie Leclerc, Regional Biologist, Kitikmeot Region, GN; Tracy Davison, Regional Biologist, GNWT; Joanna Wilson, Wildlife Biologist (Species at Risk), GNWT; and Isabelle Duclos, Species at Risk Biologist, GC.

A working group was established to develop the management plan, and the following members participated, in addition to the names listed above:

- Jimmy Haniliak – Ekaluktutiak Hunters and Trappers Organization
- Philip Kadlun, Colin Adjun, Jorgen Bolt and Larry Adjun – Kugluktuk Hunters and Trappers Organization
- Sam Kapolak – Burnside Hunters and Trappers Organization
- Luigi Toretti and Tannis Bolt – Kitikmeot Inuit Association
- David Lee and Bert Dean – Nunavut Tunngavik Incorporated
- James Qitsualik Taqaugak, Ema Qaqqutaq and Simon Qingnaqtug – Kitikmeot Regional Wildlife Board
- Mathieu Dumond, Myles Lamont and Drikus Gissing – GN
- Joshua Oliktoak – Olohaktomiut Hunters and Trappers Committee and the Inuvialuit Game Council
- Joe Ilasiak – Paulatuk Hunters and Trappers Committee and the Inuvialuit Game Council
- John Lucas Jr. and Charles Pokiak – Wildlife Management Advisory Council (NWT)
- Jan Adamczewski – GNWT
- Donna Bigelow – GC

The following organizations provided additional input and comments that improved the management plan:

- Ekaluktutiak Hunters and Trappers Organization
- Kugluktuk Hunters and Trappers Organization
- Olohaktomiut Hunters and Trappers Committee
- Paulatuk Hunters and Trappers Committee
- Kugluktuk Community Elders
- GN
- Wildlife Management Advisory Council (NWT)
- GNWT
- GC
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC)

EXECUTIVE SUMMARY

Management Planning for Dolphin and Union Caribou

Dolphin and Union Caribou play an essential role in the lives of the Inuit and Inuvialuit people. They are highly valued from a spiritual, economic, cultural and harvest perspective. They are also a species of special concern under the federal *Species at Risk Act* (SARA) and the Government of the Northwest Territories *Species at Risk (NWT) Act*.

It is essential to have a plan to sustain this population to help ensure the survival of Dolphin and Union Caribou for future generations. This plan describes management goals and objectives for Dolphin and Union Caribou as well as recommended approaches to achieve those objectives. This plan was developed collaboratively by co-management partners to meet management needs in Nunavut, Northwest Territories and at the national level. It recognizes the shared responsibilities for management under land claim agreements and species at risk legislation, and gives equal consideration to *Inuit Qaujimajatuqangit* (IQ), traditional knowledge (TK), local knowledge and scientific knowledge.

Background

Dolphin and Union Caribou are morphologically and behaviourally distinct from other barren-ground caribou populations and from Peary caribou. They migrate in the fall across the sea ice from Victoria Island to the mainland where they spend their winters, and in the spring, they migrate back to Victoria Island where they disperse to calve and raise their young. These migrations make seasonal connectivity of sea ice a key habitat requirement.

Scientific research conducted in 2015 indicates the latest population estimate is 18,413 ± 6,795 (95% CI, 11,664-25,182). This indicates a decline in the population of approximately 34% since 2007. A recent IQ/local knowledge study in Cambridge Bay also confirmed the perception of such a decline. Observations from this study included reduced body condition, a decline in the juvenile population (including calves and yearlings), increased signs of disease and an overall poor state of health among Dolphin and Union Caribou. Causes of mortality include drowning, predation, harvest, and disease to name a few.

Dolphin and Union Caribou are harvested by the communities of Kugluktuk, Umingmaktok, Bathurst Inlet and Paulatuk during the winter/spring, Ulukhaktok in the summer/fall, and Cambridge Bay in both seasons. Distribution of caribou in relation to community harvesting areas results in different harvest opportunities for each community between seasons and years.

Threats to Dolphin and Union Caribou

Dolphin and Union Caribou are facing substantial threats to population persistence. Their primary threat is a reduction in sea ice connectivity that results both from ice-breaking activities and from sea ice loss due to climate change. A decrease in sea ice connectivity

limits their range access, in particular, access to their migratory routes. Predation from wolves and grizzly bears, as well as harvest activities also present threats to Dolphin and Union Caribou. Other important threats include icing/freeze-thaw events (affecting access to forage), increased insect harassment and a rise in parasites and diseases. Climate change is an underlying driver of many of these threats. Mining, roads, flights, and competition from other species also present threats to Dolphin and Union Caribou.

Management Goal and Objectives

Recognizing the ecological, cultural and economic importance of Dolphin and Union Caribou, the goal of this management plan is to maintain the long term persistence of a healthy and viable Dolphin and Union Caribou population that moves freely across its current range and provides sustainable harvest opportunities for current and future generations.

Achieving the management goal would allow for a population level sufficient to sustain traditional Indigenous harvesting activities, and one that is consistent with land claim agreements and existing treaty rights of the Indigenous Peoples of Canada.

In order to attain this goal, five objectives were established, combined with twelve recommended approaches to achieve these objectives. These objectives and their corresponding approaches apply broadly across the population's range in both Northwest Territories and Nunavut. The approaches to management of the Dolphin and Union Caribou (Section 6.3) outline the priorities, recommended time frame and performance measures to complete the management objectives. The management plan will be reviewed every five years, further to legislated guidelines under the federal SARA and the territorial *Species at Risk (NWT) Act*. However, the adaptive management approach allows for new information to be incorporated into the management framework and actions throughout this time. The order in which the objectives are presented here does not indicate, assign, or imply differential importance.

Objective 1: Adaptively co-manage Dolphin and Union Caribou using a community-based approach.

Objective 2: Communicate and exchange information on an ongoing basis between parties using a collaborative and coordinated approach.

Objective 3: Collect information to fill knowledge gaps on Dolphin and Union Caribou using IQ and TK, community monitoring and scientific methods.

Objective 4: Minimize disturbance to habitat and preserve sea ice crossings to maintain the ability of Dolphin and Union Caribou to move freely across their range.

Objective 5: Ensure management is based on population level so future generations can benefit from sustainable harvesting opportunities.

Harvest management and other management actions should also be informed by the level and trend of the population. This management plan recommends a framework describing how management actions should be adapted at different phases in the Dolphin and Union Caribou cycle, according to when the population is increasing, high, decreasing, or low.

There are already some measures in place that assist in managing Dolphin and Union Caribou, including land claim agreements, legislation, regulations, community conservation plans, and land use planning.

This plan is intended to provide guidance and direction to the co-management partners to help them with their decision-making for Dolphin and Union Caribou management. Ongoing communications, stakeholder and community participation, and cooperation will be fundamental to the plan's success.

The specific actions needed to maintain the Dolphin and Union Caribou population are provided in an appendix and will be managed by the responsible jurisdictions, consistent with this management plan.

ACRONYMS

ATK	Aboriginal Traditional Knowledge
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DOE	Department of Environment
DU	Designatable Units
EIRB	Environmental Impact Review Board
EISC	Environmental Impact Screening Committee
ENR	Environment and Natural Resources
GC	Government of Canada
GN	Government of Nunavut
GNWT	Government of the Northwest Territories
HTC	Hunters and Trappers Committee
HTO	Hunters and Trappers Organization
IFA	Inuvialuit Final Agreement
IGC	Inuvialuit Game Council
IQ	Inuit Qaujimajatuqangit
ISR	Inuvialuit Settlement Region
IUCN	International Union for the Conservation of Nature
KIA	Kitikmeot Inuit Association
KRWB	Kitikmeot Regional Wildlife Board
NGO	Non-governmental Organization
NLCA	Nunavut Land Claims Agreement
NTI	Nunavut Tunngavik Inc.
NWMB	Nunavut Wildlife Management Board
NWT	Northwest Territories
RWO	Regional Wildlife Organization
TAH	Total Allowable Harvest
TK	Traditional Knowledge
SARA	*Species at Risk Act*
SARC	Species at Risk Committee (NWT)
SEA	Strategic Environmental Assessment
WMAC (NWT)	Wildlife Management Advisory Council (NWT)

TABLE OF CONTENTS

PREFACE 3

ACCEPTANCE STATEMENT 4

ACKNOWLEDGMENTS 5

EXECUTIVE SUMMARY 6

ACRONYMS 9

1. INTRODUCTION 13

2. PLAN DEVELOPMENT 13

2.1 Purpose and Principles 13
2.2 Planning Partners 13
2.3 Management Planning Process 16
2.4 Inuit Qaujimajatuqangit, Traditional Knowledge and Local Knowledge 18

3. HISTORICAL AND SOCIAL PERSPECTIVE 18

3.1 Communities that Harvest Dolphin and Union Caribou 19
3.2 Use of the Population and History of Harvest Management 19

4. SPECIES INFORMATION 22

4.1 Species Status and Assessment 22
4.2 Species Names 25
4.3 Species Description and Biology 27
4.3.1 Life cycle and reproduction 28
4.3.2 Natural mortality and survival 28
4.3.3 Diet 28
4.3.4 Habitat needs 29
4.4 Population and Distribution 33

5. THREATS AND LIMITING FACTORS 39

5.1 Threat Assessment 39
5.2 Description of Threats 41
5.2.1. Changes to sea ice affecting migration 41
5.2.2 Predation and competition 44
5.2.3 Harvest 46
5.2.4 Parasites, diseases and insect harassment 47
5.2.5 Other habitat changes due to climate change 49
5.2.6 Icing events 50

5.2.7 Mining 51
5.2.8 Roads 51
5.2.9 Flights 52
5.2.10 Other threats 53
5.3 Knowledge Gaps 53

6. MANAGEMENT 55

6.1 Management Goal 55
6.2 Management Objectives 55
6.3 Approaches to Management of the Dolphin and Union Caribou 56
6.4 Approaches to Achieve Objectives 62
6.5 Current Management and Other Positive Influences 68
6.6 Managing Based on Population Level 71
6.6.1. Determining population status 71
6.6.2. Management actions recommended 73

7. MEASURING PROGRESS 76

8. NEXT STEPS 77

9. REFERENCES 78

APPENDIX A: IUCN THREAT CLASSIFICATION TABLE AND THREAT CALCULATOR RESULTS FOR DOLPHIN AND UNION CARIBOU 90

APPENDIX B: DOLPHIN AND UNION CARIBOU MANAGEMENT FRAMEWORK 100

APPENDIX C: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES 106

LIST OF FIGURES

Figure 1. Management Planning Process for Dolphin and Union Caribou 17

Figure 2. Caribou Range Map in Canada, broken down into Designatable Units (COSEWIC, 2011) 26

Figure 3. Dolphin and Union Caribou near High Lake, west of Bathurst Inlet, April 2008. Photo by K. Poole, used with permission 27

Figure 4. Notable place names and the current range of Dolphin and Union Caribou (NWT Environment and Natural Resources, range data developed for Species at Risk program 2016). 30

Figure 5. Distribution of calving locations from collared caribou. Data from 1987-89 (green dots; Gunn and Fournier 2000), 1994-97 (orange triangles; Nishi 2000), 1994-97 (red stars; Nishi 2000), 1999-2006 (purple diamonds; Poole et al. 2010) and 2003-06 (yellow squares; Poole et al. 2010). Figure modified from SARC 2013, by B. Fournier, GNWT-ENR 2016. 31

Figure 6. Dolphin and Union Caribou fall migration between Victoria Island and the mainland (modified from Poole et al. (2010), by B. Fournier, GNWT-ENR 2016). 33

Figure 7. Population estimates from 1994 to 2015. 36

Figure 8. Approximate distribution of wintering Dolphin and Union Caribou during the late 1980s (pink line), and the mid-1990s to mid-2000s (gold line), based on radio-collared caribou. Data from Poole et al. (2010); figure reproduced from the SARC (2013) by B. Fournier, GNWT-ENR 2016 38

Figure 9. Dolphin and Union Caribou cycles: Determining the location of the Dolphin and Union Caribou population within its cycle. The Dolphin and Caribou population cycle is unpredictable and may vary due to changing magnitude and impact of threats 73

LIST OF TABLES

Table 1. Summary of status designations. 24

Table 2. Approximate timing of spring and fall migrations for Dolphin and Union Caribou 29

Table 3. Summary of observations on the population and distribution of Dolphin and Union Caribou, from IQ, TK, local knowledge, and science up to 1990. 34

Table 4. Threat calculator assessment 40

Table 5. Management objectives 55

Table 6. Approaches to management of the Dolphin and Union Caribou. 56

1. INTRODUCTION

Dolphin and Union Caribou play an essential role in the lives of the Inuit and Inuvialuit in Nunavut and the NWT. They are highly valued by the Indigenous Peoples in these regions from a spiritual, economic, cultural and harvest perspective. Dolphin and Union Caribou have been harvested for many generations by communities in the Arctic and there is a sense of responsibility toward stewardship of this caribou population and its habitat.

In recognition of threats and declining population trends, as identified by Traditional Knowledge (TK), Inuit Qaujimajatuqangit (IQ), local knowledge and science, Dolphin and Union Caribou were listed as Special Concern under the federal *Species at Risk Act* (SARA) and the Government of the Northwest Territories (GNWT) *Species at Risk (NWT) Act*. Under these two acts, a management plan must be developed for the Dolphin and Union Caribou.

To help ensure the survival of this species, the management plan must respect Indigenous rights while managing human behaviour. In an effort to promote long term persistence of Dolphin and Union Caribou, the plan must find a balance between the resources used today, and the resources available to future generations.

2. PLAN DEVELOPMENT

2.1 Purpose and Principles

The Dolphin and Union Caribou management plan facilitates coordination and cooperation among management partners based on the shared goal, objectives and approaches established for the population. The plan will assist management partners in assigning priorities, understanding natural processes impacting caribou, and allocating resources in order to manage human impacts on this species.

Development of the management plan was guided by the shared responsibility to manage Dolphin and Union Caribou under components of the *Nunavut Land Claims Agreement* (NLCA), *Inuvialuit Final Agreement* (IFA), federal SARA, and the GNWT *Species at Risk (NWT) Act*. Joint management planning ensured a common vision and approach for the shared population, and there was an expectation that all management partners would have the opportunity to contribute. The plan was prepared using the best available IQ, TK, local and scientific knowledge and each of these perspectives was awarded equal consideration.

2.2 Planning Partners

Planning partners refers to the groups, organizations and communities who are responsible for managing Dolphin and Union Caribou. Other organizations may be involved in managing Dolphin and Union Caribou, but they do not have management authority under land claim agreements or other legislation.

Government of Canada

The **Government of Canada** (GC) has ultimate responsibility for the management of migratory birds (as described in the *Migratory Birds Convention Act, 1994*), fish, marine mammals, and other aquatic species (as described in the *Fisheries Act*). It also has responsibilities under the federal *Species at Risk Act* (SARA), including the implementation and enforcement of protection for individuals, residences and critical habitat for listed species. The federal Minister of Environment and Climate Change and the Minister responsible for the Parks Canada Agency are ultimately responsible for the preparation and completion of a national management plan for Dolphin and Union Caribou under SARA.

Government of Nunavut

The **Government of Nunavut** (GN) Department of Environment (DOE) is responsible for the protection, management and sustainable use of wildlife in Nunavut. The GN conducts scientific research and collects IQ relevant to species of management concern in Nunavut. The GN works with co-management partners to develop and implement territorial management plans and federal recovery documents for species at risk. The Minister has the final authority to accept decisions made by the Nunavut Wildlife Management Board.

Nunavut Wildlife Management Board:

The **Nunavut Wildlife Management Board** (NWMB) is the main instrument of wildlife management established under the NLCA under Article 5. The Board and its co-management partners work together to combine the knowledge and understanding of wildlife managers, users, and the public to make decisions concerning the management of wildlife in Nunavut. The NWMB makes decisions on Total Allowable Harvest (TAH) and non-quota limitations as per the NLCA under Article 5. In addition to the NWMB, the Nunavut Land Claims Agreement created other Boards to manage the land and resources in the Nunavut Settlement Area which include the Nunavut Planning Commission (NPC), the Nunavut Impact Review Board (NIRB), the Nunavut Water Board (NWB) and the Nunavut Surface Rights Tribunal (NSRT). The NWMB, NPC, NIRB and NWB, may act together as the Nunavut Marine Council when necessary to address issues of common concern relating to the marine areas of Nunavut.

Kitikmeot Regional Wildlife Board

The **Kitikmeot Regional Wildlife Board** (KRWB) is responsible for providing ongoing advice and support to co-management partners, and allocating annual TAH, once it is set, to the affected communities. They also fulfill other wildlife co-management obligations in accordance with the NLCA under Article 5. KRWB is also responsible for reviewing management plans.

Nunavut Tunngavik Inc:

Nunavut Tunngavik Inc. (NTI), although not a management authority, is responsible for ensuring that all processes adhere to the NLCA. The *Nunavut Wildlife Act* recognizes IQ in its legislation, which obligates Nunavut to make certain that Inuit voices are included. NTI

provides information and supports the implementation of the NLCA Article 5 to the wildlife co-management partners as required.

Hunters & Trappers Organizations and Hunters & Trappers Committees:

The **Hunters and Trappers Organizations** (HTOs) in Nunavut and the **Hunters and Trappers Committees** (HTCs) in the NWT, while not necessarily management authorities, are each responsible for ensuring harvest reporting by members, allocating TAH among members where appropriate, and conducting community-based monitoring and research with the support of the other co-management partners. The Nunavut HTOs can set by-laws for their members and the NWT HTCs can make by-laws that become regulations enforceable under the *NWT Wildlife Act*. The following HTOs and HTCs were included in the development of the Dolphin and Union Caribou management plan: Kugluktuk HTO, Ekaluktutiak HTO (Cambridge Bay), Omingmaktok HTO (Bay Chimo), Burnside HTO (Bathurst Inlet), Olohaktomiut HTC (Ulukhaktok), and Paulatuk HTC.

Government of the Northwest Territories

The **Government of the Northwest Territories** (GNWT), represented by the Minister of Environment and Natural Resources (ENR), has ultimate responsibility for the conservation and management of wildlife and wildlife habitat in the NWT, in accordance with land claims and self-government agreements, and having due regard for existing, pending, and future interests in land. It is the ultimate responsibility of the Minister of ENR to prepare and complete a management plan for Dolphin and Union Caribou under the *Species at Risk (NWT) Act*.

Wildlife Management Advisory Council (NWT):

The **Wildlife Management Advisory Council (NWT)** [WMAC (NWT)] is the main instrument of wildlife management in the Inuvialuit Settlement Region (Western Arctic Region) of the NWT. The WMAC (NWT) advises the federal and territorial governments on wildlife policy, management, regulation, and administration of wildlife, habitat and harvesting in the Inuvialuit Settlement Region (ISR) (IFA, section 14). The recommendations of this co-management group provide the foundation for caribou management in the ISR. These recommendations are based on best available information including TK, local knowledge and science. The WMAC (NWT) works collaboratively with the Inuvialuit Game Council, HTCs, and other governments in research, monitoring and management of caribou and their habitat. The WMAC (NWT) consults regularly with Inuvialuit Game Council and HTCs, and these groups assist the WMAC (NWT) in carrying out its functions. The WMAC (NWT) recommends appropriate quotas for Inuvialuit wildlife harvesting, including TAH for caribou when appropriate. The WMAC (NWT) also provides comments during environmental screening and review processes regarding the monitoring and mitigation of impacts of development on Dolphin and Union Caribou and their habitat.

Inuvialuit Game Council:

Under the IFA, the **Inuvialuit Game Council** (IGC) represents the collective Inuvialuit interest in all matters pertaining to the management of wildlife and wildlife habitat in the ISR. This responsibility gives the IGC authority for matters related to harvesting rights, renewable resource management, and conservation.

2.3 Management Planning Process

Due to the multiple jurisdictions and agencies involved in managing Dolphin and Union Caribou, management must be carried out as a team to be successful. The management plan was prepared jointly by the GNWT-ENR and GN-DOE, in collaboration with the GC Environment and Climate Change, the Parks Canada Agency and the co-management partners mentioned in Section 2.2.

To facilitate the plan development, an introductory meeting outlining the management planning process took place in February 2015 with representatives of communities and co-management partners within the range of Dolphin and Union Caribou. Two joint meetings were held in Nunavut: in Kugluktuk (March 2015) and in Cambridge Bay (January 2016) with representatives of KRWB, KIA, NTI, WMAC (NWT), IGC, HTOs from Cambridge Bay, Kugluktuk, and Bathurst Inlet, and HTCs from Paulatuk and Ulukhaktok. GN, GNWT and GC also attended the meetings. The meeting participants discussed the content and framework of the management plan, new information on Dolphin and Union Caribou, threats to the population, approaches to address threats, and options for harvest management. The joint meetings provided opportunities for harvesters and co-management partners from Nunavut and the NWT to discuss Dolphin and Union Caribou issues and to share their knowledge. IQ, TK and local knowledge were shared to help form the foundation of this management plan and inform the document throughout. Notes were produced after each meeting that summarized the input and guidance provided by co-management partners (First Joint Meeting 2015; Second Joint Meeting 2016). As each draft of the management plan was completed, it was provided to all co-management partners for their review and input. The planning process is summarized in Figure 1.

Co-Management Partners
- Introductory Meeting, Yellowknife, February 2015
- First Joint Meeting, Kugluktuk, March 2015
- Second Joint Meeting, Cambridge Bay, 2016
HTOs, HTCs, Community Meetings 2016
- NU: Cambridge Bay (April 19), Kugluktuk (April 28)
- NWT: Ulukhaktok (April 20), Paulatuk (April 21)
Technical Reviews and/or Support to Post
GN, GNWT, GC, NWMB, WMAC (NWT)
- The draft and proposed plan, with edits from public consultation, was submitted to each jurisdiction and Wildlife Management Boards for review, support and/or for information. (September 2016)
General Public Review
- Proposed Management Plan posted for public review on the federal Species at Risk Public Registry. (March 2017)
- Proposed Management Plan posted for public review on the NWT Species at Risk Website. (March 2017)
Final Posting
- Final Management Plan submitted to each jurisdiction and Wildlife Management Board for approval. (August - September 2017)

Figure 1. Management Planning Process for Dolphin and Union Caribou.

In addition, the GNWT and the WMAC (NWT) visited Ulukhaktok and Paulatuk in July 2014 to discuss listing the Dolphin and Union Caribou. They returned to the community of Ulukhaktok in June 2015 to discuss the Dolphin and Union Caribou Management Framework. Comments and feedback were considered and incorporated into the management plan.

Community meetings were held in Cambridge Bay, Kugluktuk, Paulatuk and Ulukhaktok in April 2016 to review the draft management plan. Each section of the plan was summarized and explained with the goal of collecting feedback from HTO and HTC board members and from community members. Notes were later produced that summarized the input and guidance provided by each community (Ekaluktutiak HTO 2016; Kugluktuk HTO 2016; Paulatuk HTC 2016; Olohaktomiut HTC 2016).

Input from all parties including the general public was solicited once more through the posting of the proposed draft plan for comment on the federal Species at Risk Public Registry and on the NWT species at risk website. GNWT also consulted on the draft management plan with relevant Indigenous organizations including the IGC and NTI with respect to potential infringement of established or asserted Indigenous or treaty rights.

Feedback received during engagement and consultation was considered when drafting the final plan. The final plan was then submitted to GN, GNWT, GC, WMAC (NWT), and NWMB for approval.

2.4 Inuit Qaujimajatuqangit, Traditional Knowledge and Local Knowledge

This management plan incorporates scientific knowledge and local knowledge, and is guided equally by IQ and TK principles.

The term "local knowledge" used in this document fits the definition of Local Ecological Knowledge defined by Charnley et al. (2007): "Local ecological knowledge is defined here as knowledge, practices, and beliefs regarding ecological relationships that are gained through extensive personal observation of and interaction with local ecosystems, and shared among local resource users".

IQ is the system of values, knowledge, and beliefs gained by Inuit through generations of living in close contact with nature. For Inuit, IQ is an inseparable part of their culture and includes rules and views that affect modern resource use.

Inuvialuit prefer the term TK (Armitage and Kilburn 2015). TK is "a cumulative body of knowledge, know-how, practices and presentations maintained and developed by the peoples over a long period of time. This encompasses spiritual relationships, historical and present relationships with the natural environment, and the use of natural resources. It is generally expressed in oral form, and passed on from generation to generation by storytelling and practical teaching" (Smith 2006).

Recommendations for the management of Dolphin and Union Caribou will continue to be guided by the best available local knowledge, and IQ and TK information. Observations from elders and other knowledgeable community members, including local harvesters, are fully integrated into this management plan along with scientific research.

The practical application of IQ, TK, and local knowledge demonstrates the value of local consultations in order to document and preserve IQ and TK before it is lost. The communities of the western Kitikmeot region and the eastern ISR will continue to be engaged on an ongoing basis to ensure that IQ and TK as well as local knowledge are utilized in conjunction with scientific information in the management of the Dolphin and Union Caribou.

3. HISTORICAL AND SOCIAL PERSPECTIVE

For thousands of years, the northern Indigenous Peoples have subsisted off the land, using all available resources, including caribou. Caribou have formed the foundation for the Inuit and Inuvialuit lifestyle and culture.

For many western Arctic communities, the Dolphin and Union Caribou have traditionally provided an important source of food and raw material. In earlier times, caribou bones and antlers were shaped into tools, sinew was used for thread and hides were used to make winter parkas, summer tents, and sleeping skins. Dolphin and Union Caribou continue to provide a strong social and economic base for the Inuit and Inuvialuit who live in their range, by providing subsistence food and economic opportunities for local guides. Relationships in the communities are established and enhanced by sharing and exchanging the harvest.

On a spiritual level, the Inuit and Inuvialuit people hold tremendous respect toward caribou. This carries with it certain obligations not to unduly harm or disrespect the animal. Prayer and leaving offerings before hunting are important aspects of this belief. Respecting rules about the use of meat and hides, including sharing of harvest and not wasting meat, are also considered essential to this approach.

3.1 Communities that Harvest Dolphin and Union Caribou

The distribution of Dolphin and Union Caribou crosses two jurisdictions - Nunavut and NWT. They are harvested by Indigenous, resident[1], and non-resident[2] harvesters in both territories. Dolphin and Union Caribou are harvested by the communities of Kugluktuk, Umingmaktok, and Bathurst Inlet in the winter/spring as well as Paulatuk during the winter. They are harvested in Ulukhaktok in the summer/fall, and Cambridge Bay in all seasons. During the spring season, some Cambridge Bay hunters cross to the mainland and can access Dolphin and Union Caribou as they migrate back to Victoria Island. This population may also be harvested by people from other communities, other Canadian provinces and territories, as well as non-Canadians (with restrictions).

3.2 Use of the Population and History of Harvest Management

Opportunities to harvest caribou are highly dependent on caribou movement and distribution of the population in relation to human settlements. At the beginning of the last century, the Dolphin and Union Caribou range was closely tied with the Dolphin and Union

---

[1] NWT Resident: A Canadian citizen or landed immigrant who has been living in the NWT for 12 continuous months.

Nunavut Resident: A Canadian citizen or landed immigrant who has been living in Nunavut for at least three months.

[2] Non-resident (NWT): A Canadian citizen or landed immigrant who lives outside the NWT or has not resided in the NWT for 12 months.

Non-Resident (Nunavut): A Canadian citizen or landed immigrant who lives outside Nunavut or has not resided in Nunavut for at least three months.

Strait, where caribou migrated from Victoria Island to the mainland. There, they were available for harvesting from outpost camps at Read Island and Bernard Harbour (First Joint Meeting 2015). During the 1920s, the caribou population began dwindling and at the same time, their migration to the mainland ceased. An eastward shift of caribou winter range made it possible for the community of Cambridge Bay, on the eastern side of Victoria Island, to rely on this population, as highlighted by IQ holders (First Joint Meeting 2015). Dolphin and Union Caribou were not available to the communities located on the Canadian mainland until the 1980s. At that point, they resumed their migration, this time through the Coronation Gulf, becoming accessible to hunters from Paulatuk, Kugluktuk, Umingmaktok and Bathurst Inlet.

There are challenges to evaluating the historical and current harvest pressure on this population. Past harvest reporting through harvest studies was voluntary in both jurisdictions and there are several sources of error that are common between the Inuvialuit and Nunavut harvest studies (Inuvialuit Harvest Study 2003; NWMB 2004). Some harvesters declined to be interviewed; this can be an issue, particularly if those hunters are very active. Some harvesters may have under-reported in order to avoid the survey or because of a misunderstanding of use of the data. Also, some harvesters may have been overlooked and not included in the harvest interviews. There is also the potential issue of inconsistent reporting and inability of harvesters to recall their harvest accurately. Further details on the errors and how they could have impacted results are found in the reports for each harvest study (Inuvialuit Harvest Study 2003; NWMB 2004). Current reporting of harvest is either voluntary or not collected; therefore harvest numbers are often unreliable and incomplete. This uncertainty was one of the reasons that the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed Dolphin and Union Caribou as a species of special concern in 2004 (COSEWIC 2004), since a harvest of 2,000 to 3,000 caribou was estimated at this time based on the Kitikmeot Harvest study. This estimate did not necessarily account for the likely under-reporting of harvest (Gunn and Nishi 1998; Nishi and Gunn 2004).

The Inuvialuit Harvest study ran from 1988 to 1997. During that time the estimated harvest by the community of Ulukhaktok (Holman - calculated using reported harvest and response rates) was 189 to 681 caribou per year, with a mean of 441 (Inuvialuit Harvest Study 2003). However, the type of caribou was not specified. Based on the seasonal migrations, if it is assumed Dolphin and Union Caribou are only on Victoria Island between June and November, the maximum estimated annual Dolphin and Union Caribou harvest was 178 to 509 per year, with a mean of 329. In 1994/95, an Olohaktomiut HTC by-law was put in place for Peary caribou north of Minto Inlet (I/BC/03 area). The Inuvialuit Harvest Study data reflects this change in harvest with the overall caribou harvest declining to approximately 30% of levels at the beginning of the study (1988) but the proportion of caribou harvest in the winter (assuming Peary caribou) declining from > 45% in 1988 to less than 1% in 1997. Another harvest data collection took place in Ulukhaktok from 2001 to 2009. According to that study, reported harvest (not corrected for response rate) ranged from 32 to 360 caribou harvested per year in I/BC/04 (area south of Minto inlet and around Prince Albert Sound) (ENR 2015a). Based on Inuvialuit Harvest Study data and

community comments, there is likely a small harvest of caribou north-east of Paulatuk along the coast.

The Nunavut Harvest Study - from 1996 to 2001 - revealed that Kugluktuk harvested on average 1,575 caribou annually, Cambridge Bay: 811, Bathurst Inlet: 93, and Umingmaktok: 176 caribou (NWMB 2004). In other words, this study shows a total annual subsistence harvest of 2,655 caribou from these four communities. However, the accuracy of the Nunavut harvest study has been questioned since hunters did not specify the type of caribou harvested or the population/herd from which they were harvested. Therefore, the proportion of Dolphin and Union Caribou taken annually in each of the communities still remains unknown. It is well known that the proportion of the harvest made up by each population/herd is very inconsistent and varies widely from year to year, based on distribution and the accessibility of each population/herd to the communities (Second Joint Meeting 2016). The preliminary results from the harvest of Dolphin and Union Caribou from 2010 to 2014, revealed a harvest of only 10 to 80 caribou. These were voluntarily reported as harvested on an annual basis around Kugluktuk (GN-DOE, in prep).

In both Nunavut and NWT, while subject to conservation principles, there are currently no harvest limitations on the Dolphin and Union Caribou for beneficiaries[3]; they can harvest this caribou to the full extent of their economic, social and cultural needs. Community members from both Ulukhaktok and Kugluktuk explained that they increase their harvest of Dolphin and Union Caribou in response to a decrease in access or availability of other populations/herds (Second Joint Meeting 2016). Some hunters agree that the cost of gas and food is so high that it limits or prevents them from harvesting. Fewer hunters go out now and fewer caribou are harvested as store bought food is available and the need to feed dog teams has diminished (First Joint Meeting 2015). Thus, there is a pressing need to have a stronger effort to monitor and manage harvest so future actions can address the current harvest pressure.

[3] A Beneficiary is an Aboriginal person who is on an enrollment list of a specified comprehensive land claim agreement and is entitled to certain rights under that agreement.

4. SPECIES INFORMATION

4.1 Species Status and Assessment

COSEWIC Species Assessment Information (COSEWIC 2004)

Date of Assessment: May 2004

Common Name (population): Barren-ground caribou (Dolphin and Union population)

Scientific Name: *Rangifer tarandus groenlandicus*

COSEWIC Status: Special Concern

Reason for Designation: This population of caribou is endemic to Canada. Once thought to be extinct, numbers have recovered to perhaps a quarter of the population historic size. They have not been censused since 1997 and are subject to a high rate of harvest, whose sustainability is questioned by some. They migrate between the mainland and Victoria Island and climate warming or increased shipping may make the ice crossing more dangerous. The population, however, increased substantially over the last three generations and was estimated at about 28000 in 1997.

Canadian Occurrence: Northwest Territories, Nunavut

COSEWIC Status History: The original designation considered a single unit that included Peary Caribou, *Rangifer tarandus pearyi*, and what is now known as the Dolphin and Union Caribou, *Rangifer tarandus groenlandicus*. It was assigned a status of Threatened in April 1979. Split to allow designation of three separate populations in 1991: Banks Island (Endangered), High Arctic (Endangered) and Low Arctic (Threatened) populations. In May 2004 all three population designations were de-activated, and the Peary Caribou, *Rangifer tarandus pearyi*, was assessed separately from the Dolphin and Union Caribou, *Rangifer tarandus groenlandicus*. The Dolphin and Union Caribou is comprised of a portion of the former "Low Arctic population", and it was designated Special Concern in May 2004.

Assessment of Dolphin and Union Caribou in the NWT by the Species at Risk Committee (SARC 2013)

The Northwest Territories Species at Risk Committee met in Yellowknife, Northwest Territories on December 11, 2013 and assessed the biological status of Dolphin and Union Caribou in the Northwest Territories. The assessment was based on the approved status report for Dolphin and Union Caribou. The assessment process and objective biological criteria used by the Species at Risk Committee are available at www.nwtspeciesatrisk.ca.

Assessment: Special Concern in the Northwest Territories
The species is particularly sensitive to human activities or natural events but is not Endangered or Threatened.

Reasons for the assessment: Dolphin and Union Caribou fits criteria (a) and (b) for Special Concern.

(a) – The species has declined to a level at which its survival could be affected by population characteristics, genetic factors or environmental factors but the decline is not sufficient to qualify the species as Threatened.

(b) – The species may become Threatened if negative factors are neither reversed nor managed effectively.

Main Factors:

- Although there is too little information to assess long-term population trends of Dolphin and Union Caribou, there is evidence that the population has declined between 1997 and 2007.
- There is no possibility of rescue from neighbouring populations. Dolphin and Union Caribou are considered to be discrete from Peary caribou and barren-ground caribou, based on their morphology, genetics and behaviour (i.e., the distinct rutting area as well the herd's seasonal migrations across the sea ice of the Dolphin and Union Strait).
- Dolphin and Union Caribou are vulnerable to major environmental events such as changes in the timing of sea ice formation, changes to the thickness of sea ice, and icing and crusting events on their fall and winter range.

NatureServe Ranks: NatureServe ranks Dolphin and Union Caribou as unranked at the global level (TNR[4]) and imperiled-vulnerable at the national level (N2N3; , NatureServe 2015). Dolphin and Union Caribou are ranked as imperiled-vulnerable (S2S3) in the NWT and as unranked (SNR) in Nunavut.

Legal listing: Dolphin and Union Caribou is listed as Special Concern (2011) under Canada's SARA and is listed as Special Concern (2015) under the territorial *Species at Risk (NWT) Act*.

In Nunavut, Dolphin and Union Caribou are not assessed or listed under territorial endangered species legislation. The *Nunavut Wildlife Act* has provisions for species at risk but regulations are not enacted.

Table 1. Summary of status designations.

Jurisdiction	NatureServe Rank[2]	Status Assessment	Legal Listing
Canada	N2N3	Special Concern (COSEWIC 2004)	Special Concern (SARA 2011)
Nunavut	SNR	N/A	N/A
NWT	S2S3	Special Concern (SARC 2013)	Special Concern (*NWT Species at Risk (NWT) Act* 2015)

[2] Types of ranks: N = national conservation status rank; S = sub-national (provincial or territorial) ranks. Definitions: 2 = imperiled; 3 = vulnerable; NR = unranked.

[4] Types of ranks: T = subspecies. Definitions: NR = unranked.

4.2 Species Names

Common name used in this report: Dolphin and Union Caribou

Other common names: Island caribou (NWT and Nunavut; English), Arctic-island caribou (NWT and Nunavut; English), Mainland caribou (Ulukhaktok, NWT; English), Barren-ground caribou (Dolphin and Union population) (English), caribou du troupeau Dolphin-et-Union (French), Tuktuk (Inuktituk), Tuktu (Inuinnaqtun), Tuktu/tuktut (Siglitun), Tuttu (Ummarmiutun)

Scientific name: In 2004, COSEWIC designated Barren-ground Caribou (*Rangifer tarandus groenlandicus*), Dolphin and Union population, as special concern. The species was added to the List of Wildlife Species at Risk (Schedule 1) of SARA. In 2011, COSEWIC created 'Designatable Units' (DU) for caribou (*Rangifer tarandus*) in Canada using a number of variables to classify the different herds or groups of herds (Figure 2, COSEWIC, 2011). These DU descriptions provided a clear and consistent scheme for identifying DUs due to the complexity of *Rangifer tarandus* in Canada. The Dolphin and Union population of Barren-ground Caribou was determined to belong to *Rangifer tarandus groenlandicus* (DU2), and was simply referred to as Dolphin Union Caribou. Although this naming convention differs slightly from the COSEWIC assessment (2004) and Schedule 1 of SARA, the common name used henceforth in the management plan will follow the suggested 2011 DU name: Dolphin and Union Caribou.

The GNWT's Species at Risk Committee (SARC) used *Rangifer tarandus groenlandicus x pearyi* in their 2013 Status Report (SARC, 2013), and the GN also uses this naming convention to identify Dolphin and Union Caribou. Despite what is suggested by the Dolphin and Union Caribou's subspecies designation, genetic evidence reveals that it is distinct from the Peary caribou and from the migratory barren-ground caribou that is also of subspecies *groenlandicus* (McFarlane et al. 2016).

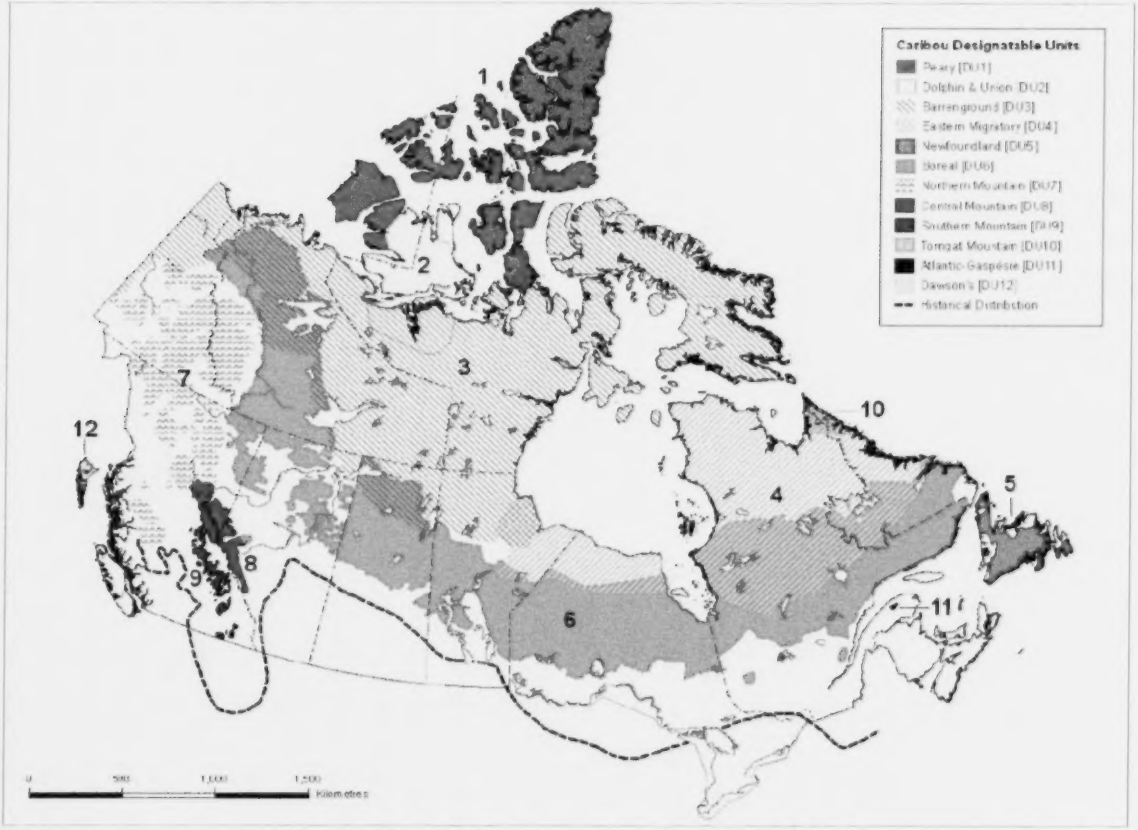


Figure 2. Caribou Range Map in Canada, broken down into Designatable Units (COSEWIC, 2011).

Occurrence: Dolphin and Union Caribou occur in Canada and are restricted to Victoria Island and the mainland opposite Victoria Island. They cross two jurisdictions: Nunavut and NWT.

4.3 Species Description and Biology

Figure 3. Dolphin and Union Caribou near High Lake, west of Bathurst Inlet, April 2008. Photo by K. Poole, used with permission.

Dolphin and Union Caribou are morphologically and behaviourally different from other barren-ground caribou (*Rangifer tarandus groenlandicus*) populations and from Peary caribou (*Rangifer tarandus pearyi*) (COSEWIC 2011). They are best identified using a combination of characteristics (Kugluktuk HTO 2016). They are mostly white in winter, and are grey with white underparts in summer (Figure 3). They have grey down the front of their legs, unlike the white legs of Peary caribou, and the shape of their muzzle is different from barren-ground caribou. They are also larger than Peary caribou, but smaller than the darker brown barren-ground caribou. The antler velvet of the Dolphin and Union Caribou is most commonly pale grey, similar to Peary caribou; this is a striking distinguishing characteristic compared to the brown velvet of barren-ground or boreal woodland (*R.t. caribou*) caribou. Genetic analysis confirms that Dolphin and Union Caribou are genetically distinct from Peary and barren-ground caribou. Their physical similarity to Peary caribou suggests similar evolutionary pressures having evolved in a similar environment, but they share haplotypes with the neighbouring barren-ground caribou herds which suggests a certain degree of inter-breeding (Zittlau 2004; Eger et al. 2009; McFarlane et al. 2009; McFarlane et al. 2016).

One particular behaviour that distinguishes Dolphin and Union Caribou from the mainland barren-ground caribou populations is their seasonal migrations. Twice a year, thousands of Dolphin and Union Caribou cross the sea ice in a synchronous and coordinated way to reach their summer and winter grounds. Below a certain population threshold, migration may cease; in fact, this took place in the early 1920s when population numbers were very low. At the time, Dolphin and Union Caribou remained on Victoria Island year-round.

4.3.1 Life cycle and reproduction

Dolphin and Union Caribou population dynamics are not well-documented although the population shares some life-history strategies similar to barren-ground caribou. The rut starts in mid-October, concurrently with their fall staging and migration. It is typical for a Dolphin and Union Caribou bull to mate with more than one cow.

Accessibility of forage can impact a caribou cow's body condition, which then determines the age of first pregnancy and the annual likelihood that a cow will conceive (Thomas 1982; Gerhart et al. 1997). Under good conditions such as abundant forage, low stress and low parasitism, a female caribou can have a single calf every year (Heard 1990; Thorpe et al. 2001). Pregnancy rates are annually variable (Nishi 2000; Hughes 2006; CARMA 2012; SARC 2013).

Dolphin and Union Caribou are relatively long-lived with a reproductive lifespan of about 12 years (SARC 2013). Hughes (2006) found the age of harvested Dolphin and Union Caribou cows ranged from 1.8 to 13.8 years with a mean age of 6.5 years. One caribou with a marked ear was observed approximately 20 years after the marking program had stopped (First Joint Meeting 2015).

4.3.2 Natural mortality and survival

There are challenges in measuring natural mortality, and details on survival rates of Dolphin and Union Caribou are limited. Cow survival, measured using a small number of collared cows between 1999 and 2006, was relatively low (76%; Poole et al. 2010). Causes of mortality include drownings, predation, harvest, and malnutrition associated with both icing events and parasites and disease (Gunn and Fournier 2000; Miller 2003; Patterson unpubl. data 2002; Poole et al. 2010). These sources of mortality are discussed in detail in Section 5.

4.3.3 Diet

Caribou eat a variety of plants, depending on the time of year and plant availability. They are known to eat lichens, willows, grasses, dwarf birch, mountain avens, Arctic sorrel, mushrooms, moss campion and berries (Thorpe et al. 2001; Dumond et al. 2007; Olohaktomiut Community Conservation Plan 2008; Badringa 2010; Ulukhaktok TK interviews 2011-2013).

In the 1990s, rumen contents of Dolphin and Union Caribou were investigated in early and late winter on Victoria Island. In November, sedges, dwarf shrubs (mountain avens and willow) and forbs dominated their diet, while lichen and moss formed only a small fraction. In April, dwarf shrubs continued to dominate their diet. This is unusual, as winter caribou diets are usually dominated by lichen such as reindeer lichen, snow lichen and worm lichen (Staaland et al. 1997). However, the low lichen proportion in the Dolphin and Union Caribou diet is similar to that of Peary caribou, where lichen constitutes a small part of the available biomass and their diet (Miller and Gunn 2003). After the snow melts in mid-July, Dolphin and Union Caribou feeding generally focuses on moist sites and their diets include

grasses and green willows (Dumond et al. 2007). Although their summer diet has not been investigated through science, Dolphin and Union Caribou have been described as having a very green stomach in the summer (Ulukhaktok TK interviews 2011-2013).

4.3.4 Habitat needs

Due to migrations between Victoria Island and the mainland (Table 2), a key habitat requirement for Dolphin and Union Caribou is the seasonal connectivity of the sea ice.

Table 2. Approximate timing of spring and fall migrations for Dolphin and Union Caribou

Time of year	Migration on land or sea ice	Direction of the migration
Late March - April	Land	Move northward to mainland coast.
April - May	Sea ice	Migrate from mainland coast to Victoria Island and also to ancillary islands.
September - October	Land	Migrate to southern part of Victoria Island and gather in staging areas near southern coast.
End of October - December	Sea ice	Cross the sea ice to their winter range on the mainland.

Spring migration

In late March and April, Dolphin and Union Caribou begin moving northward to the coast for their migration to Victoria Island (Figure 4). Some Indigenous Peoples have observed that prior to migration, Melbourne Island is an important area for staging (Gunn et al. 1997). During the migration, the Inuit indicate that Dolphin and Union Caribou leave Brown Sound area in April, moving from Arctic Sound and Rideout Island toward Elu Inlet and then across to Cambridge Bay. They also observe caribou crossing the Coronation Gulf, via the Kent Peninsula and arriving on Victoria Island, either north of Bathurst Inlet or further east at Cambridge Bay (Archie Komak, Ikaluktuuttiak in Thorpe et al. 2001). Poole et al. (2010) found a mean ice crossing distance northwards for collared cows of 40 km (± 7.2 km).

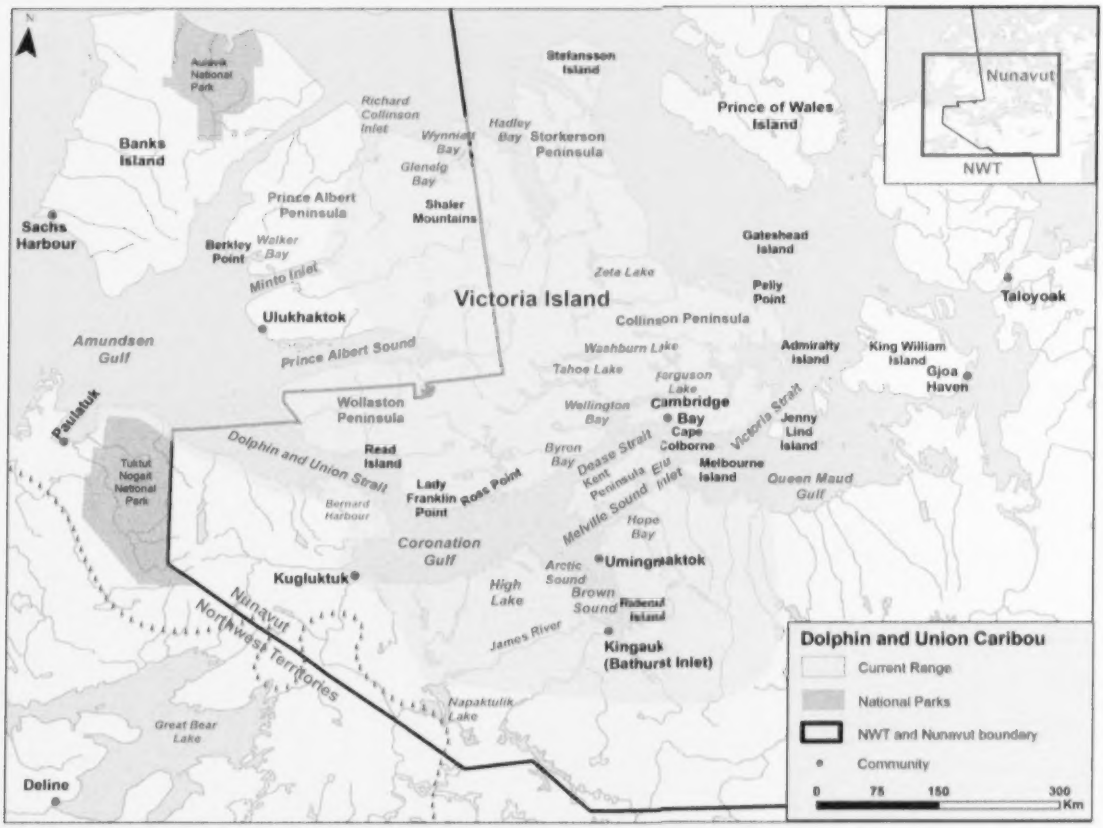


Figure 4. Notable place names and the current range of Dolphin and Union Caribou (NWT Environment and Natural Resources, range data developed for Species at Risk program 2016).

Summer

Although Dolphin and Union Caribou usually spend their summers on Victoria Island, they have also been found on the ancillary islands: Read Island, Gateshead Island, Jenny Lind Island and Admiralty Island. Their summer range is known to extend to the northern part of Victoria Island, in the Wynniatt Bay area, the Shaler Mountains and the northern extent of Storkerson Peninsula with rare sightings on Stefansson Island (Figure 4).

During the summer, Dolphin and Union Caribou adopt an individualistic calving strategy in which they give birth at locations dispersed across the island. They might calve alone or in small groups, but they do not form a large aggregation or use a distinct calving ground that can be delineated with confidence (Figure 5). Typically for other caribou such as the barren-ground caribou, large flat areas are chosen for calving, likely to facilitate effective detection of predators (Thorpe et al. 2001). Although barren-ground caribou females come

back to the same site to give birth, this calving site fidelity has not been scientifically demonstrated for Dolphin and Union Caribou. The condition of the tundra may also impact where caribou cows choose to calve (Thorpe et al. 2001).

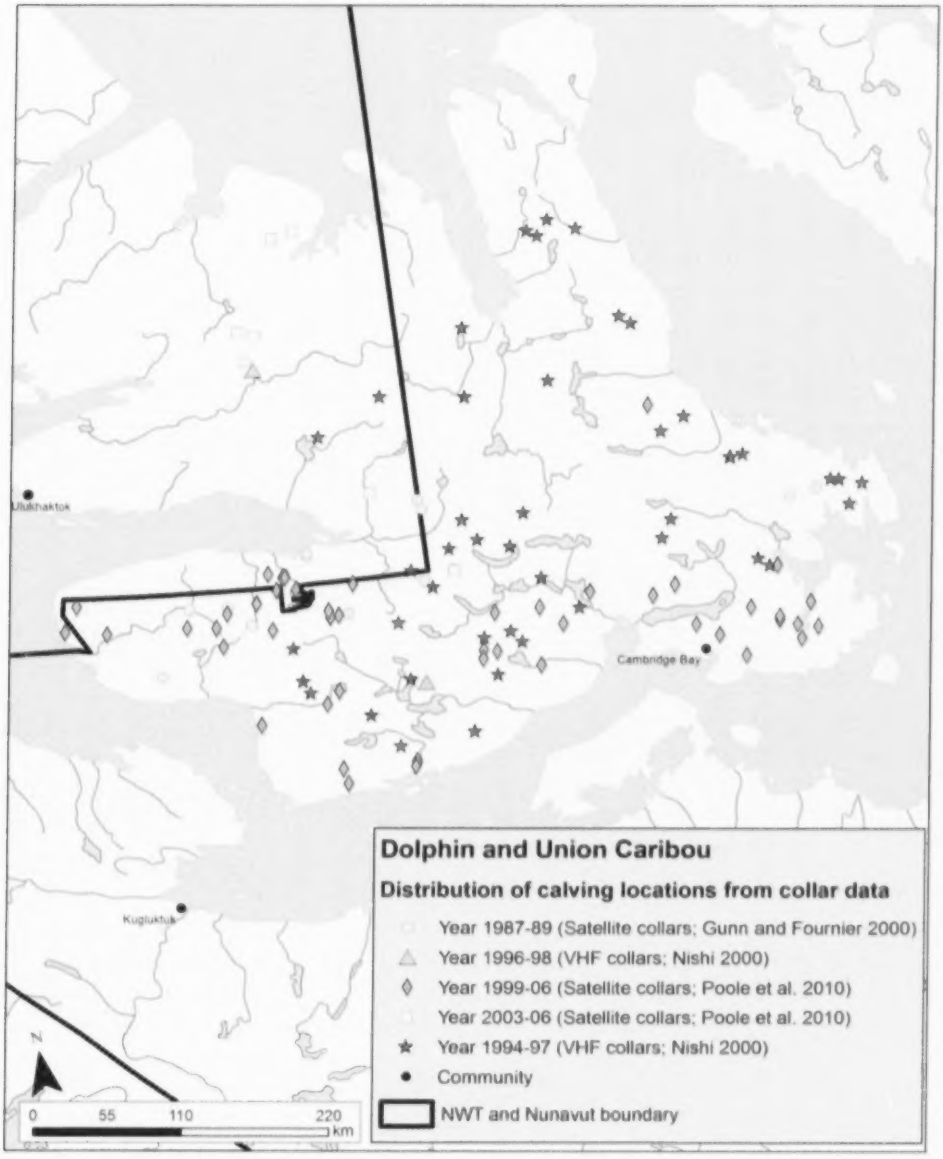

Ulukhaktok
Cambridge Bay
Kugluktuk
Dolphin and Union Caribou
Distribution of calving locations from collar data
Year 1987-89 (Satellite collars; Gunn and Fournier 2000)
Year 1996-98 (VHF collars; Nishi 2000)
Year 1999-06 (Satellite collars; Poole et al. 2010)
Year 2003-06 (Satellite collars; Poole et al. 2010)
Year 1994-97 (VHF collars; Nishi 2000)
Community
NWT and Nunavut boundary
N
0 55 110 220
km

Figure 5. Distribution of calving locations from collared caribou. Data from 1987-89 (green dots; Gunn and Fournier 2000), 1994-97 (orange triangles; Nishi 2000), 1994-97 (red stars; Nishi 2000), 1999-2006 (purple diamonds; Poole et al. 2010) and 2003-06 (yellow squares; Poole et al. 2010). Figure modified from SARC 2013, by B. Fournier, GNWT-ENR 2016.

Food supply for the newborn calf and its mother is highly important, as newborns and mothers have high nutritional needs. During the summer, calves must grow quickly and store fat for the winter; therefore access to high quality vegetation is important (Thorpe et al. 2002). Caribou will often seek out areas where the snow has melted and fresh green growth is available. After their mother's milk, cottongrass may be the first vegetation consumed by calves (Thorpe et al. 2001).

During the summer, caribou typically seek cooler and damp areas where high winds provide relief from insects and the summer heat. They frequently find wet, marshy areas and may sometimes stand in water, or swim to escape the summer heat and insects. They also seek out shorelines as these areas provide protection from wolves at night and opportunities for grazing (Thorpe et al. 2001).

Fall migration

Between September and October, Dolphin and Union Caribou migrate to the southern part of Victoria Island to cross the sea ice to their winter range on the mainland (Figure 6). As they wait for sea ice to form, they gather in staging areas to feed and rest before making their migration. It is believed Dolphin and Union Caribou use their staging time for intensive feeding before their fall migration (Gunn et al. 1997).

Dolphin and Union Caribou typically cross the sea ice to the mainland between the end of October and early December, and the majority will cross in a short window of time. Caribou are seen crossing from Cape Colborne to Kent Peninsula within a few days (Nishi and Gunn 2004). Poole et al. (2010) observed caribou to take 4.0 days (± 0.53 d) to cross from Victoria Island to the mainland, while another observed this crossing to occur in one day (L. Leclerc Regional Biologist, GN, DOE, pers. comm. 2016). Poole at al. (2010) also found a mean ice crossing distance southwards for collared cows of 48.1 km (± 7.8 km).

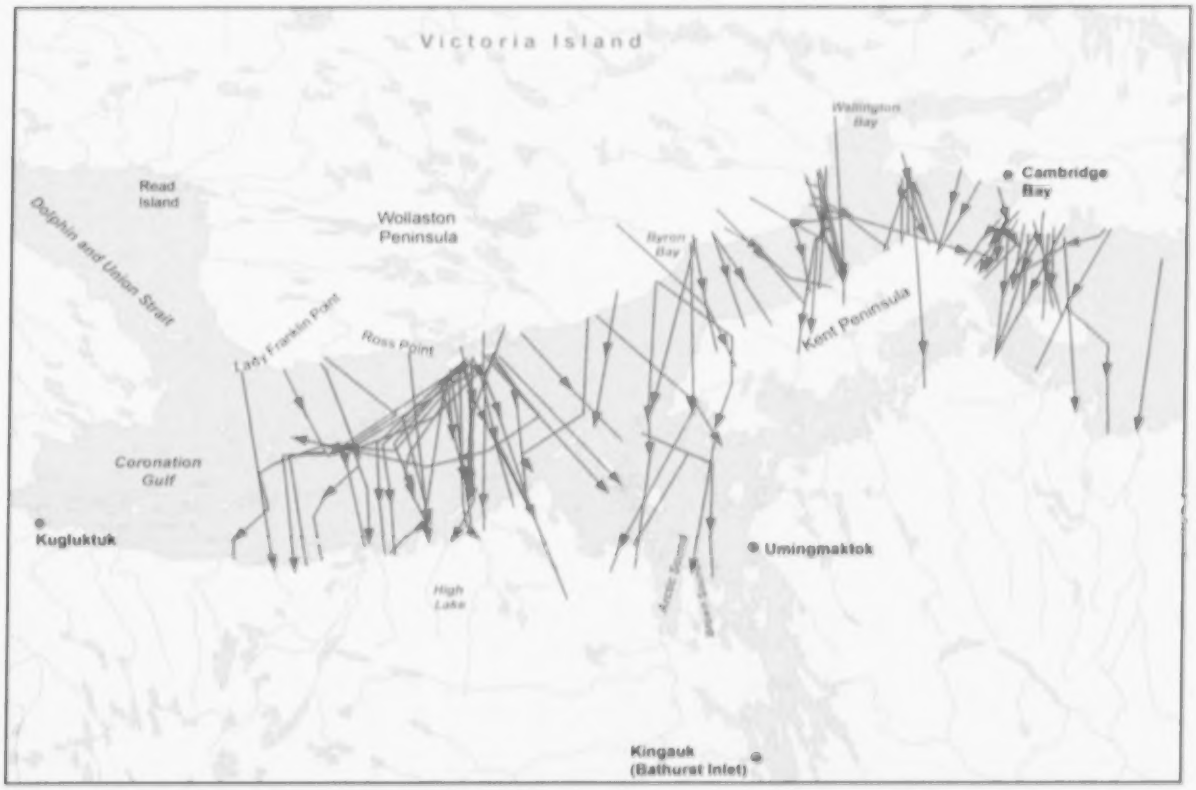


Figure 6. Dolphin and Union Caribou fall migration between Victoria Island and the mainland (modified from Poole et al. (2010), by B. Fournier, GNWT-ENR 2016).

Winter

Historically, Victoria Island was used as a wintering area for Dolphin and Union Caribou when caribou numbers were low and the sea ice crossing had temporarily ceased (see Section 4.4). Since the migration has resumed, the mainland has now become their wintering ground, where it typically offers rich winter feeding opportunities (Thorpe et al. 2001). Snow cover influences habitat selection as it is linked to the energy costs associated with digging through snow to access forage, as well as travelling within and among habitat patches. They typically avoid deep or "sleet-covered" snow as it is more difficult to access food (Thorpe et al. 2001). Therefore, one key habitat requirement is terrain and vegetation that offers choices to caribou as they adjust their foraging to changing snow conditions (Larter and Nagy 2001; SARC 2013).

4.4 Population and Distribution

Observations of the population and distribution of Dolphin and Union Caribou through IQ, TK, local knowledge, and from science observations up to 1990, are described in Table 3.

As seen in Table 3, limited scientific information is available for Dolphin and Union Caribou, with the majority of information provided through IQ, TK, and communities.

Table 3. Summary of observations on the population and distribution of Dolphin and Union Caribou, from IQ, TK, local knowledge, and science up to 1990.

Timeline	Population	Distribution
Beginning of 20th century	- Little scientific information on population - Information derived from explorers' log books, records from trading posts, observations from geologists during exploration trips (Manning 1960) - Population thought to be abundant (100,000) and small portion of population remained on Victoria Island throughout the year while others migrated to mainland (Manning 1960)	- Known for seasonal migration across the Dolphin and Union Strait (First Joint Meeting 2015) - Humans harvested caribou along this Strait for centuries (Manning 1960; Savelle and Dyke 2002; Brink 2005) - Caribou stopped sea ice crossing to mainland, wintered on Victoria Island in 1920s (Gunn 2008) - Caribou were not seen around Read Island and Byron Bay in 1950s (First Joint Meeting 2015) - 1960s caribou began expanding their range to Cambridge Bay (First Joint Meeting 2015) - Cambridge Bay hunters travelled up to 100 miles north/west on Victoria Island, to hunt Dolphin and Union Caribou or to hunt Peary Caribou on the northern part of the island (First Joint Meeting 2015; Olohaktomiut HTC 2016)
First half of 20th century	- Population declined (Gunn 1990) - Caribou stopped migrating between mainland and Victoria Island (Nishi and Gunn 2004) - Almost no caribou sightings in 1900s (Gunn 1990) - 1920s caribou disappeared (Gunn 1990)	
1970s – early 1980s	- Caribou sightings increased, particularly on southern/central Victoria Island (Gunn 1990)	- 1970s – 1997 saw a winter range expansion extending to southern Victoria Island (Figure 8) - Winter migration across the sea ice to the mainland in 1980s (Nishi 2000) - Caribou observed to winter on mainland coast and southern coast of Victoria Island (south of Cambridge Bay) in early 1990s (Figure 8) - Early and mid-1990s - Hunter observations from outpost camps suggest the annual fall migration
1990s	- Population decreasing around Ulukhaktok (Ulukhaktok TK Interviews, 2011-2013)	
1960s – 1990s	- Cambridge Bay local knowledge (Tomaselli et al. 2016a, 2018): population increasing around Cambridge Bay	

Timeline	Population	Distribution
		was consistent and extensive (Nishi and Gunn 2004)
1990s – 2005	- Cambridge Bay local knowledge (Tomaselli et al. 2016a, 2018): pre-declining period with high caribou numbers observed around Cambridge Bay	-Caribou observed to winter on mainland (Figure 8) -Winter range extending further south than in the past (TK and community knowledge sources cited in SARC 2013)
Mid-2005 – end of 2014	Cambridge Bay local knowledge (Tomaselli et al. 2016a, 2018): - Population declined but more evident since 2010 - Observed 80% less caribou in 2014 compared to 1990s - Decrease in calves and yearlings - Poorer body condition - Increased observations of abnormalities/diseases in caribou	
2011 – 2015	- Decrease in numbers around Cambridge Bay (First Joint Meeting 2015)	

Population:

In June 1994, an aerial survey was undertaken in the western two-thirds of Victoria Island and estimated a total of 14,539 ± SE 1,016 caribou which was later extrapolated to 22,368 caribou (Dumond and Lee 2013) (Figure 7). Aerial census during the fall rut is the best approach for population surveys of Dolphin and Union Caribou, and this method was first developed and used in 1997 by Nishi and Gunn (2004). They surveyed the south coast of Victoria Island when Dolphin and Union Caribou were gathered, waiting for freeze up and estimated the population at 27,948 ± SE 3,367 caribou. In 2007, Dumond estimated the population at 21,753 ± SE 2,343 in the survey area on the south part of Victoria Island. Dumond later extrapolated his estimate by increasing it to 27,787 ± CI[5] 7,537, to account

[5] Confidence Interval: "A confidence interval accompanies a survey estimate, to represent the variation that exists with this method. It means that if the survey were to be done repeatedly under the same conditions, the estimates would fall within that range. So with a 95% confidence interval, if the survey was repeated many

for caribou that were outside the survey zone (Dumond 2013; Dumond and Lee 2013). This was completed by using information on collared caribou that had not yet reached the coast at the time of the aerial survey. The same analysis was applied to the 1997 estimates resulting in a revised extrapolated estimate of 34,558 ± CI 6801 caribou (Dumond and Lee 2013). Statistically this decline is not significant ($z = 1.21$, $p = 0.23$), but when combined with other factors, it is thought that a decline is present for Dolphin and Union Caribou (SARC 2013). A trend in the population is difficult to establish from two estimates. Based on the 1997 and 2007 surveys, the conclusion to be made was that the population remained at best stable over that decade, although without monitoring it is impossible to consider how the herd number varied on an annual basis.

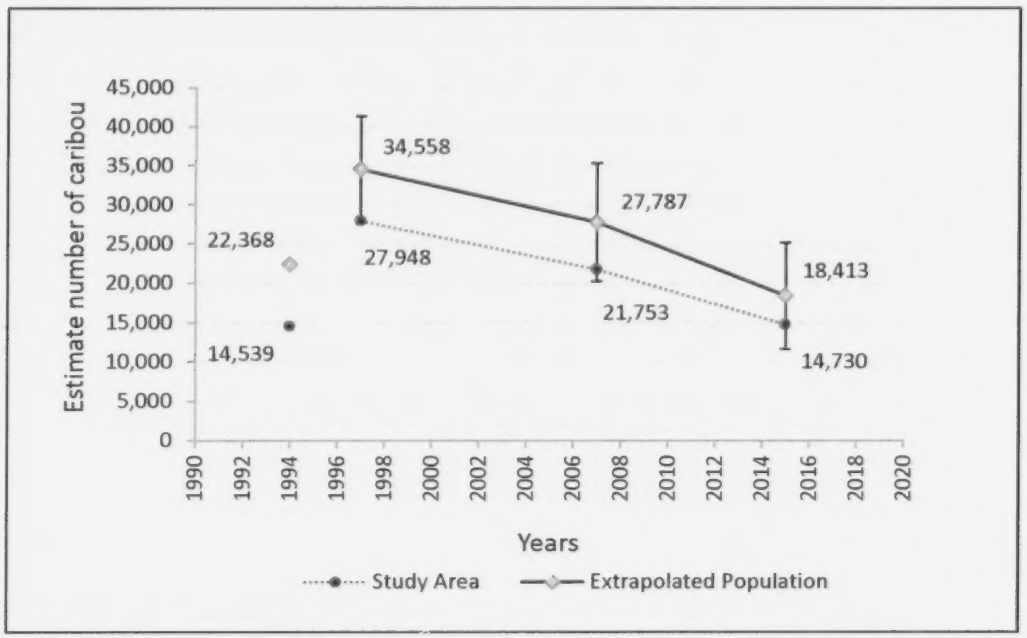


Figure 7. Population estimates from 1994 to 2015.

An aerial population assessment was completed in fall 2015, with the extrapolated population of Dolphin and Union Caribou estimated at 18,413 ± 6,795 (95% CI, 11,664-25,182) when using information for the current collared caribou (Leclerc and Boulanger in prep.). This estimate shows signs of decline relative to the 2007 survey

---

times, 95% of the time the estimates would fall within that range." (Advisory Committee for Cooperation on Wildlife Management 2016, p. 8)

estimates (z-test, Z=-2.19, p=0.036). There has been an overall decline of 33.7%, or 5% annually since 2007. More research and monitoring of this population are needed to better understand the rate of decline. This compares with IQ and local knowledge collected in a study conducted from summer to winter 2014 in the community of Ikaluktutiak (Cambridge Bay) on Victoria Island, Kitikmeot Region, Nunavut. By the end of 2014, community residents reported observing 80% (IQR[6]: 75-90%) fewer Dolphin and Union Caribou in the Ikaluktutiak area (Cambridge Bay area) compared to what they used to see in the 1990s (Tomaselli et al. 2016a, 2018). According to IQ and local knowledge, caribou began to decline around 2005, in conjunction with the decline of muskoxen observed in the same area. In addition, since the start of the decline, participants observed a decrease of the juvenile age class (calves and yearlings) that transitioned from 35% (IQR: 30-35) observed prior to the decline, to 20% (IQR: 15-30) during the decline; an overall decrease of the body condition status; and, finally, an overall increase in animals with abnormalities (morbidity) from 7.5% (IQR: 5-45) in the pre-decline period, to 30% (IQR: 10-47) during the decline (Tomaselli et al. 2016a, 2018). Thus, it will be important to monitor the Dolphin and Union Caribou herd closely over the next several years to obtain demographic characteristics and assess any further signs of decline in productivity and health of the population. More research and monitoring are planned by the GN.

[6] IQR, or interquartile range, is a measure used in descriptive statistics to represent the variability or spread of the observations. In particular, it represents the spread of the 50% of the observations around the median value (Upton and Cook 1996).

Distribution:

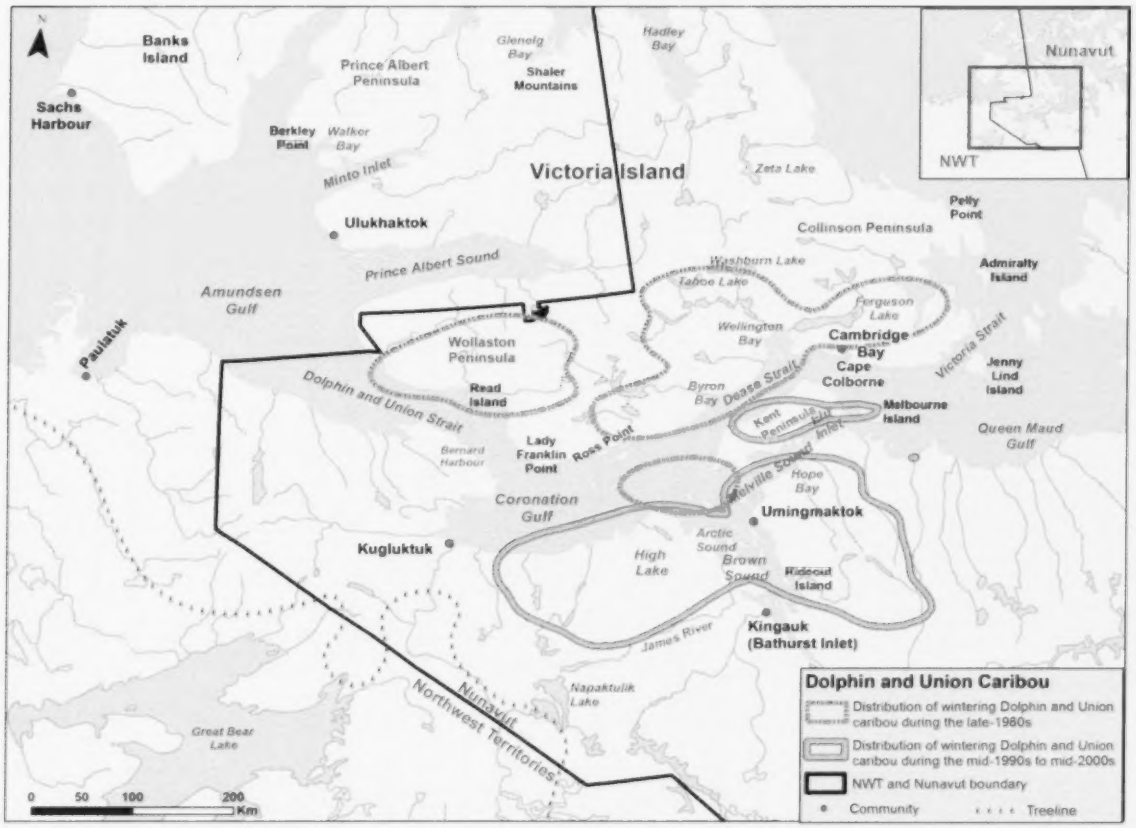


Figure 8. Approximate distribution of wintering Dolphin and Union Caribou during the late 1980s (pink line), and the mid-1990s to mid-2000s (gold line), based on radio-collared caribou. Data from Poole et al. (2010); figure reproduced from the SARC (2013) by B. Fournier, GNWT-ENR 2016.

From their contracted distribution in the first half of the 20th century, the Dolphin and Union Caribou range expanded eastward and southward (First Joint Meeting 2015) (see Figures 4 and 8). Although most of this population crossed the Dolphin and Union Strait at the beginning of the century, the caribou are now more likely to cross closer to the Western Queen Maud Gulf and Dease Strait (Poole et al. 2010). In addition, some Indigenous Peoples indicate that over the last decade, they have observed Dolphin and Union Caribou outside of the species' regular winter range, as far south as the treeline and north of Great Bear Lake (Philip Kadlun of Kugluktuk, cited in Golder Associates Ltd. 2003). In the past 3-4 years around Cambridge Bay, Elders felt that the caribou were using a different migration route (First Joint Meeting 2015). Although speculative, these changes may be related to climate change as the caribou need to find safe ice to cross the strait. They may also need to extend their winter range farther south to find available forage.

5. THREATS AND LIMITING FACTORS

5.1 Threat Assessment

The process of determining threats to Dolphin and Union Caribou was initiated at a joint meeting of co-management partners in Kugluktuk in March 2015 (First Joint Meeting 2015). This meeting included local communities, organizations and government agencies and was followed up by a second joint meeting in January 2016 in Cambridge Bay (Second Joint Meeting 2016). The threats identified during these meetings are documented and explained in this section.

The Dolphin and Union Caribou threat assessment (Table 4) is based on the International Union for the Conservation of Nature (IUCN) - Conservation Measures Partnership unified threats classification system (2006). Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational). Limiting factors are not considered during this assessment process. Historical threats, indirect or cumulative effects of the threats, or any other relevant information that would help understand the nature of the threats are presented in Section 5.2. The threat classification table for Dolphin and Union Caribou (Table 4; Appendix A) was completed by a panel of IQ, TK, local knowledge and scientific experts on Dolphin and Union Caribou in December 2014 and updated in February 2016.

Table 4. Threat calculator assessment

Threat #	Threat	Impact[a]	Scope[b]	Severity[c]	Timing[d]	Description
1	Residential & commercial development	Negligible	Negligible	Extreme	High	
1.1	Housing & urban areas	Negligible	Negligible	Extreme	High	
3	Energy production & mining	Low	Restricted	Slight		
3.1	Oil & gas drilling	Not Calculated			Insignificant/ Negligible	
3.2	Mining & quarrying	Low	Restricted	Slight	High	• Mining (excluding roads / flights / shipping)
4	Transportation & service corridors	High	Pervasive - Large	Serious	Moderate	
4.1	Roads & railroads	Low	Restricted	Slight	Moderate	• Roads
4.2	Utility & service lines	Negligible	Negligible	Negligible	Unknown	
4.3	Shipping lanes	High	Pervasive - Large	Serious	High	• Marine traffic / ice breaking
4.4	Flight paths	Low	Restricted	Slight	High	• Scheduled flights
5	Biological resource use	Medium - Low	Pervasive	Moderate - Slight	High	
5.1	Hunting & collection	Medium - Low	Pervasive	Moderate - Slight	High	• Harvest
6	Human intrusions & disturbance	Negligible	Restricted	Negligible	High	
6.1	Recreational activities	Negligible	Negligible	Negligible	High	
6.2	War, civil unrest, & military exercises	Not Calculated			Insignificant/ Negligible	
6.3	Work & other activities	Negligible	Restricted	Negligible	High	• Unscheduled flights
8	Invasive & other problematic species & genes	High - Low	Pervasive	Serious - Slight	High	
8.1	Invasive non-native/alien species	Medium - Low	Large - Restricted	Moderate	High	• Parasites and diseases (both native and non-native)
8.2	Problematic native species	High - Low	Pervasive	Serious - Slight	High	• Predation (eg wolves, grizzly) • Competition (eg muskoxen) • Insect harassment
8.3	Introduced genetic material	Unknown	Large - Small	Unknown	High	• Interbreeding
9	Pollution	Not Calculated				
9.4	Garbage & solid waste	Not Calculated				
11	Climate change & severe weather	Medium – Low	Pervasive	Moderate - Slight	High	
11.1	Habitat shifting & alteration	Medium – Low	Pervasive	Moderate - Slight	High	• Sea ice loss • Vegetation changes
11.4	Storms & flooding	Medium - Low	Large	Moderate - Slight	Moderate	• Icing Events
Overall Threat Impact: Very High – High						

[a] Impact is calculated based on scope and severity. Categories include: very high, high, medium, low, unknown, negligible

[b] Scope is the proportion of the population that can reasonably be expected to be affected by the threat within the next 10 years. Categories include: Pervasive (71-100%); Large (31-70%); Restricted (11-30%); Small (1-10%); Negligible (<1%), Unknown. Categories can also be combined (e.g., Large-Restricted = 11-70%).

[c] Severity is, within the scope, the level of damage to the species (assessed as the % decline expected over the next three generations [7years = 1 generation for Dolphin and Union Caribou]) due to threats that will occur in the next 10 years. Categories include: Extreme (71-100%); Serious (31-70%); Moderate (11-30%); Slight (1-10%); Negligible (<1%); Unknown. Categories can also be combined (e.g., Moderate to slight = 1-30%).

[d] Timing describes the immediacy of the threat. Categories include: High (continuing); Moderate (possibly in the short term [<10 years or three generations]); Low (possibly in the long term [>10 years or three generations]); Negligible (past or no direct effect); Unknown.

5.2 Description of Threats

Threats are the proximate activities or processes that directly and negatively affect the Dolphin and Union Caribou population. There are a variety of threats that affect Dolphin and Union Caribou and their habitat across Victoria Island and the mainland. The threats presented here represent those found in both the NWT and Nunavut.

The overall calculated Threat Impact for this population is Very-High to High (Table 4). The most significant threats to Dolphin and Union Caribou are shipping lanes and predation. Other important threats are habitat change due to climate change (particularly sea ice loss), icing events, harvest, parasites, diseases and insect harassment. Mining, roads and aircraft flights are also threats to this species. Each threat discussed by the panel is described below from high to low impact and each threat category has a standard number that correlates to the IUCN classification system.

5.2.1. Changes to sea ice affecting migration

The threats that result in changes to sea ice affecting caribou migration (marine traffic [IUCN #4.3] and sea ice loss due to climate change [IUCN #11.1]) are discussed sequentially here due to their similar impacts, even though the causes differ.

IUCN Threat #4.3 Shipping Lanes (High Impact)

An increase in shipping traffic when sea ice is forming or during the ice season poses a grave threat to Dolphin and Union Caribou. The threat is exacerbated by a continually growing shipping season (due to a shorter sea ice season) that allows more access through the straits for marine traffic. Combined, these two factors interfere with the formation of sea ice and increase the risk of caribou drowning.

An increase in shipping, including icebreaking, is already evident in the straits between Victoria Island and the mainland - the primary migration route for Dolphin and Union Caribou (Poole et al. 2010; Dumond et al. 2013; ENR 2015b; ENR 2016; First Joint Meeting 2015; Ekaluktutiak HTO 2016; Second Joint Meeting 2016). Similar observations were made with Peary Caribou (Miller et al. 2005), which can be related to Dolphin and Union Caribou. The number of transits through the Northwest Passage increased from four per year in the 1980s to 20-30 per year in 2009-2013 (ENR 2015b). The greater portion of these transits are icebreakers on coast guard and research duties, small vessels or adventurers, cruise ships, and tug and supply vessels with the majority of trips being made between August and October. A large portion of the rise in transits since the late 1980s is due to a rise in tug-supply vessels for the oil and gas industry, half of which have icebreaking capacity (ENR 2015b). The majority of ships travel through the Amundsen Gulf, Dolphin and Union Strait, and Dease Strait, close to the Arctic mainland. Only 8% of transits travel the Beaufort Sea through the northern routes around Banks Island (ENR 2015b). Overall, annual commercial use of the Northwest Passage by ships with icebreaking capacity or that are escorted by icebreakers has been increasing rapidly. Higher risk of oil or waste spills, changes in ice conditions due to leads by ship wakes, and

impacts on wildlife and marine species are some potential effects of increased shipping activities (ENR 2015b; ENR 2016).

Indigenous communities have observed this rise in marine traffic and are concerned about its impacts on sea ice formation. They have already noted an increase in the number of caribou drownings in recent years, sometimes hundreds of caribou (Thorpe et al. 2001; Miller et al. 2005; First Joint Meeting 2015; Second Joint Meeting 2016). One harvester mentioned that he had seen a ship break through 12 inches of ice in the third week of October during fall migration (Ekaluktutiak HTO 2016). Another community member explained that a further increase in shipping will likely not allow adequate time for the ice to re-freeze, since three inches of ice is needed to allow caribou to cross (First Joint Meeting 2015). The community's concerns extend to the safety of harvesters and others out on the ice as well as other species including muskox (Ekaluktutiak HTO 2016).

Researchers have also noted an increase in shipping, changes in timing and patterns of sea ice formation and its impact on caribou migration. Dumond et al. (2013) documented a delay in migratory movements due to the temporary maintenance of an open-water boat channel at Cambridge Bay in 2007. Shipping during the ice free season (June to August) has a negligible impact on Dolphin and Union Caribou. However, if shipping were to become year round, or earlier in the spring or later in the fall, there could potentially be further consequences for Dolphin and Union Caribou. An increase in shipping activities in October would impact sea ice formation, which could then impact Dolphin and Union migration (Table 2). Some researchers suggest that year round marine traffic and ice breaking activities could fragment the Dolphin and Union range and ultimately prevent the Dolphin and Union Caribou's fall and spring migrations altogether (Miller et al. 2005).

There is a strong economic incentive to allow more shipping and ice breaking activity in Canada's Arctic, particularly through the Northwest Passage. Nationally, it would provide opportunities for exploration and extraction of natural resources. It would also allow more access to tourism, particularly cruise ships traveling through the open channels. Internationally, the appeal of the Northwest Passage lies in the 11,000 km that would be removed from the Europe-Asia route through the Panama Canal and the 19,000 km that would be cut off the trip around Cape Horn for the supertankers that are too big to use the Panama Canal (Kerr, as cited in Miller et al. 2005). In fact, year-round shipping, and/or the creation of shipping lanes through Arctic waters have already been proposed as part of some resource extraction projects (Miller et al. 2005; Dumond et al. 2013) and the Canadian Coast Guard has been tasked with developing Northern Marine Transportation Corridors (Canadian Coast Guard 2014).

<u>IUCN Threat #11.1 Habitat Shifting and Alteration* (Medium - Low Impact)</u>

*Note - This threat as assessed includes vegetation changes, discussed in Section 5.2.5.

Among the many impacts of climate change across the Arctic (see the other aspects of IUCN Threat #11.1 Habitat Shifting and Alteration, below), the most significant impact for

Dolphin and Union Caribou is the change in sea ice along their migratory route. As noted in the threat listed above (shipping lanes), thinner and/or unstable ice cannot support the weight of caribou during their migration.

Warming temperatures in the Arctic are causing ice freeze-up to take place later in the fall, and spring thaw to take place earlier in the season (Miller et al. 2005; Gunn 2008; Poole et al. 2010; First Joint Meeting 2015; Kugluktuk HTO 2016; Second Joint Meeting 2016). On the south coast of Victoria Island, warmer fall temperatures have been recorded over the last sixty years, resulting in delays in sea ice formation. New ice formation (newly formed, less than 10 cm thick) occurred 10 days later in 2008 than in 1982, and grey ice formation (10-15 cm thick) formed 8 days later during the same period (Poole et al. 2010). Warmer temperatures diminish the chances of sea ice achieving uniform thickness and Inuit have reported high mortality among Dolphin and Union Caribou due to migration over thin, unstable and freshly formed sea ice (First Joint Meeting 2015; Second Joint Meeting 2016). Although caribou can swim, they are unlikely to cross distances longer than a few kilometres (Dumond et al. 2013) and sometimes cannot pull themselves out of the water (SARC 2013).

Climate change is seen by some Inuit as the most important threat for Dolphin and Union Caribou (First Joint Meeting 2015; Kugluktuk HTO 2016). With the change in sea ice formation, some Dolphin and Union Caribou may not complete their migration to the mainland and instead are left stranded on the ice, where they drift out to sea. They eventually perish from starvation and/or exhaustion, while attempting to swim back to land (Kugluktuk HTO 2016). There are hunters who have seen up to 150 caribou floating on a piece of ice in the Coronation Gulf and sometimes they are even found frozen into the sea ice with their head protruding from the ice (First Joint Meeting 2015). Other caribou have been known to swim to land but have perished soon after emerging from the water (Allen Niptanatiak and Dustin Fredlund, as cited in Dumond et al. 2013). Of the caribou who survive, in recent years, hunters have observed an increasing number on the mainland with a thick coat of ice on their fur, indicating that caribou fell through the ice but were able to make it to the nearby shore of the mainland (Poole et al. 2010; Dumond et al. 2013; Kugluktuk HTO 2016). Ice build-up on their fur is challenging for caribou and adds to their stress (Kugluktuk HTO 2016).

With the delay in freeze up, caribou may waste energy changing their movement pattern in the east-west direction looking for an ice formation that will allow them to start migration. One community member noted that Dolphin and Union Caribou were still migrating past Cambridge Bay in January of 2016, which was surprising since the caribou have usually finished their migration by January (Second Joint Meeting 2016). Other harvesters have noticed that some caribou try to cross the sea ice earlier than in the past, which is becoming increasingly dangerous (Kugluktuk HTO 2016).

The delay in freeze-up and milder fall conditions could also result in a longer staging time on the south coast of Victoria Island. This delay forces Dolphin and Union Caribou to use

summer fat reserves and may also increase grazing pressure on portions of their range (Poole et al. 2010). A longer staging time, particularly on the southern coast of Victoria Island, also results in increased vulnerability to predation and harvest (Poole et al. 2010).

Cumulative Impacts of Changes to Sea Ice

Given their migration patterns, seasonal connectivity of the sea ice between Victoria Island and the mainland is essential to Dolphin and Union Caribou. Combined, marine traffic (calculated as a high impact threat) and climate change (calculated as a medium-low impact threat) can affect ice formation to the point where this species may be forced to stop their migrations. It is questionable whether Victoria Island could support a self-sustaining population if the ability to cross the ice is lost (Miller et al. 2005; Dumond et al. 2013). Although there was a time historically when migration across the sea ice stopped and caribou remained on Victoria Island year-round, caribou numbers at that time were extremely low, possibly due to icing events and the introduction of rifles (Manning 1960; Gunn 1990). Later in the 20th century, as the population increased, their migration resumed. It is believed that the sea ice connection may have been fundamental to the recovery of the Dolphin and Union Caribou (see Section 4.4).

5.2.2 Predation and competition

IUCN Threat #8.2 Problematic Native Species (High - Low Impact)

There are various species that may negatively affect the Dolphin and Union Caribou through predation or competition, but there is still uncertainty around their impacts at a population level.

Arctic Wolves (Canis lupus arctos)

Wolves are the primary predators of Dolphin and Union Caribou and their pressure on the population size is difficult to measure. Community members have noticed an increase in wolf numbers over the last 10 to 20 years. In interviews conducted in the 1990s, it was felt this increase did not have a negative effect on caribou (Adjun 1990); but more recently, Inuit and Inuvialuit have expressed serious concerns over a rise in wolf numbers and its potential impacts (Ulukhaktok TK interviews 2011-2013; First Joint Meeting 2015; Ekaluktutiak HTO 2016; Kugluktuk HTO 2016; Second Joint Meeting 2016). One hunter reported that he saw seven or eight caribou taken down by wolves within one mile (Second Joint Meeting 2016). Some Indigenous Peoples have voiced concern that wolf predation is not being given enough attention, considering that wolves are the primary predators of Dolphin and Union Caribou (Ekaluktutiak HTO 2016).

In the 1960s, Inuit would traditionally track down wolf dens and kill wolf pups as a measure to control wolf numbers. Nowadays, this practice is becoming less common and these specific skill sets are slowly vanishing (First Joint Meeting 2015).

There is little scientific information available on wolf abundance or its impacts on caribou. Sightings of wolves during aerial surveys for caribou and muskoxen have increased (SARC 2013), although it is important to note that predator observations during aerial surveys are not indicative of a species' population size. Numbers of muskoxen increased on Victoria Island in the 1990s (Gunn and Patterson 2012) and it has been theorized that the muskox population may support more wolves, leading to a potential increase in predation of Dolphin and Union Caribou (SARC 2013). However, there is no direct scientific information on predation rates. More research is needed to learn about wolf interactions with Dolphin and Union Caribou.

Grizzly Bear (Ursus arctos)

Since the early 2000s, more grizzly bears have been observed on Banks Island and Victoria Island than in the past (Dumond et al. 2007; Slavik 2011; SARC 2013; First Joint Meeting 2015; Joint Secretariat 2015; Ekaluktutiak HTO 2016; Olohaktomiut HTC 2016). This increase could be related to fewer bears being shot for food (Dumond et al. 2007) and/or a northward expansion of their range, perhaps due to changes in habitat and prey availability (SARC 2012a; SARC 2012b; SARC 2013; First Joint Meeting 2015). Grizzly bears usually focus their predation efforts on young caribou, particularly newborn calves. However, with the dispersed calving practices of Dolphin and Union Caribou, the impact of grizzly bears on this population may be limited (SARC 2013).

Other predators

Indigenous Peoples are also seeing more bald eagles. This presents further challenges to Dolphin and Union Caribou because bald eagles, like golden eagles, feed on calves (Kugluktuk HTO 2016).

Muskoxen (Ovibos moschatus) and other herbivores

Some Indigenous Peoples cite muskoxen as having a negative influence on Dolphin and Union Caribou due to competition for forage and/or avoidance (Gunn 2005; Ekaluktutiak HTO 2016; Olohaktomiut HTC 2016). According to IQ and TK sources, muskoxen have been known to trample the ground and dig up plants, decreasing available forage for caribou (Ulukhaktok TK interviews 2011-2013). Some TK holders have expressed concern over the relationship between caribou and muskox, noting that muskoxen are known to displace the caribou by their smell (Ulukhaktok TK interviews 2011-2013). Other TK holders such as those near Umingmaktok, say that for the last 25 years, they have observed caribou and muskox sharing habitat and grazing next to each other during the winter months (First Joint Meeting 2015).

There are differing opinions in the scientific literature about whether and under what conditions muskoxen and other herbivores (e.g., hare, ptarmigan and lemming) compete with caribou for forage or space (Larter et al. 2002; Gunn and Adamczewski 2003). Muskox abundance increased on Victoria Island in the 1980s and 1990s (Gunn and Paterson 2012), but showed a decline from 2013-2014 (L. Leclerc, pers. comm. 2016). Schaefer et al. (1996) found that the habitat use patterns of muskoxen, hares and ptarmigan foraging on

southeast Victoria Island in the 1990s did not overlap with caribou. However, Hughes (2006) found overlap in diet and habitat use between muskoxen and caribou on southern Victoria Island in the mid-2000s and suggested that inter-specific competition was taking place. It has also been suggested that muskoxen (as alternate prey) could sustain wolf predation on Dolphin and Union Caribou, or could influence caribou-parasite relationships (Hughes et al. 2009; SARC 2013).

Geese

Populations of Snow Geese (*Chen caerulescens*) and Ross's Geese (*Chen rossii*) on the east side of the Dolphin and Union Caribou wintering range have increased to well above their population objectives; they have now been designated as overabundant (CWS Waterfowl Committee 2014; 2015). The population of Greater White-fronted Geese (*Anser albifrons*) has also increased substantially since the late 1980s (CWS Waterfowl Committee 2015). In the Queen Maud Gulf, geese have become so abundant, they have expanded beyond prime nesting sites to marginal sites. Their substantial populations are affecting the vegetation, which has raised concerns that arctic ecosystems were possibly imperiled through intensive grazing (Batt 1997). Their impacts include vegetation removal through the alteration or elimination of plant communities, which can transform the soil into mud and can cause changes to soil salinity, nitrogen dynamics and moisture levels (CWS Waterfowl Committee 2014; 2015). Communities indicate that these changes compromise Dolphin and Union Caribou forage during winter (First Joint Meeting 2015; Second Joint Meeting 2016). Snow geese and Ross's geese are subject to special conservation measures to control their abundance but success of the measures to date has been mixed (CWS Waterfowl Committee 2014).

Inuit and Inuvialuit have also noted an overabundance of geese over the past decade (First Joint Meeting 2015). In particular, they point out the resulting habitat destruction on Victoria Island. To date, there has been no scientific research examining the impacts of habitat destruction on caribou specifically, but community members have voiced concern over this trend (First Joint Meeting 2015).

5.2.3 Harvest

IUCN Threat #5.1 Hunting and Collecting (Medium – Low Impact)

Although this threat was assessed according to IUCN criteria as having a medium-low impact, arguments could be made to rank the threat as a high-low impact due to uncertainty of harvest levels. At the December 2014 meeting of scientific and TK experts, the impact classification was high-low. This was later changed to medium-low impact in February 2016 as the panel of experts felt this was more representative of the current impact of harvesting, given that the population has been less accessible to communities in recent years.

Harvest is important to beneficiaries in the communities within the range of the Dolphin and Union Caribou population. Dolphin and Union Caribou can currently be lawfully harvested by Indigenous Peoples and resident and non-resident hunters (defined in Section 3.1) throughout the Nunavut and NWT[7] range. Harvesting directly affects the caribou population by removing individuals from the herd. The impact of harvest is less important when caribou are abundant and numbers are increasing, particularly if the rate of harvest is low. However, harvest can have a negative impact when the population is declining or low, particularly if the rate of harvest is high. The effects of harvest on a population depend not just on the total number of caribou taken, but also on the sex ratio and age structure of the harvest, and whether the population is increasing, decreasing or stable.

Currently, harvest levels and overall harvest rate for the Dolphin and Union Caribou population are unknown. Therefore, there is uncertainty around how harvest affects the population trend. Harvest can have a greater impact on the population trend when the population is declining, since it exacerbates the decline, but the magnitude and extent of the impact is unknown. Previous harvest studies provide an indication of harvest levels at the time (see Section 3.2), but reporting was not (and still is not) mandatory for subsistence harvest. Therefore, the lack of recent data on harvest numbers and the challenges of identifying harvested caribou according to their population, creates considerable uncertainty in estimating harvest levels.

5.2.4 Parasites, diseases and insect harassment

IUCN Threat #8.1 Invasive Non-native Alien Species (Medium - Low Impact)*

*Note – both native and non-native diseases/parasites were considered in this category.

Parasites, disease and insect harassment pose a moderate threat to Dolphin and Union Caribou through effects on body condition, pregnancy rates, and survival. Warmer temperatures allow for transmission of new parasites and diseases, and a longer staging time before fall migration creates prolonged exposure to these parasites and a potential increase in the rate of infection (Poole et al. 2010; Kutz et al. 2015; Tomaselli et al. 2016a, 2018). Local communities have reported a rise in diseased caribou (Poole et al. 2010; First Joint Meeting 2015; Tomaselli et al. 2016a, 2018) and some Inuit have expressed concern about its potential impacts on human health when consuming the meat (Kugluktuk HTA 2016; Olohaktomiut HTC 2016; Leclerc and Boulanger in prep.).

[7] At the time of publication of this document, in the NWT, non-resident harvest is not taking place since there are no tags allocated for non-resident hunters.

Concern has been expressed by researchers and communities about brucellosis in Dolphin and Union Caribou and its potential impacts (Ekaluktutiak HTO 2016; First Joint Meeting 2015; Kutz et al. 2015; Olohaktomiut HTC 2016; Second Joint Meeting 2016). The *Brucella* bacterium (which causes Brucellosis) is known to circulate in northern caribou and is endemic in many populations. It was recently confirmed in Dolphin and Union Caribou (Kutz et al. 2015). Its confirmation was not surprising, as it is known that caribou across the barrenlands are periodically infected. Brucellosis is an important cause of infertility in caribou and may play an important role in population declines (Kutz et al. 2015). For example, *Brucella* was associated with the population decline of the Southampton barren-ground caribou population after it was newly introduced to that population (Government of Nunavut 2013). The bacterium also causes swollen joints, which can make caribou more susceptible to predation. Since the mid-2000s, more caribou have been observed with swollen joints and/or limping in the Cambridge Bay area (Tomaselli et al. 2016a, 2018). The bacterium has also been found in muskoxen in the same area (Tomaselli et al. 2016b; Tomaselli, PhD candidate, Faculty of Veterinary Medicine, University of Calgary, pers. comm. 2017).

Another bacterium, *Erysipelothrix rhusiopathiae*, appears to cause rapid death of animals in muskoxen and has been implicated in widespread muskox mortalities in the Western Canadian Arctic and Alaska (Kutz et al. 2015). Its impact on caribou is less clear, however the bacterium has been implicated as the cause of death in some barren-ground caribou and woodland caribou in Nunavut, Alberta and B.C. (Kutz et al. 2015; Schwantje et al. 2014). Serology shows that some Dolphin and Union Caribou have been exposed to the bacterium, indicating that it is circulating in the Dolphin and Union Caribou population (Kutz et al. 2015). It has been suggested that this pathogen might play a role in future Dolphin and Union Caribou population dynamics (Kutz et al. 2015).

Two types of lungworms and muscle worms have been detected in Dolphin and Union Caribou. Previously absent in the Arctic islands, *Varestrongylus eleguneniensis* was first discovered on Victoria Island in 2010 and affects both caribou and muskoxen (Kutz et al. 2014). The impacts on caribou are not known; however, it is not likely a major cause of disease (Kutz et al. 2015). It is believed this parasite was introduced by Dolphin and Union Caribou migrations to Victoria Island and warming temperatures have allowed its survival and spread. With warmer temperatures and a longer staging time on the island due to later freeze-up, there is now greater opportunity for exposure to the *Varestongylus* parasite and greater risk of transmission of both this and potentially other diseases (Kutz et al. 2014; Poole et al. 2010; Tomaselli et al. 2016a, 2018).

The second species which was recently detected in Dolphin and Union Caribou is *Parelaphostrongylus andersoni* (Kafle et al. in review). Found in caribou across the North American mainland, this parasite lives in the muscles of caribou and travels to the lungs via the bloodstream. In high numbers, the *Parelaphostrongylus* parasite can cause muscle inflammation and wasting as well as lung disease as the eggs and larvae migrate through the lungs (Kutz et al. 2015). The recent detection of this species is the first report

of this parasite in Dolphin and Union Caribou and could signal a possible range expansion (Kafle et al. in review).

Nematode roundworms are commonly found as gastrointestinal parasites in caribou and muskoxen and at least two species are shared between muskoxen and Dolphin and Union Caribou (Kutz et al. 2014). At high levels, nematode parasites can cause reduced body condition and pregnancy rates (Hughes et al. 2009; Kutz et al. 2014). In recently collected Dolphin and Union Caribou samples, *Marshallagia marshalli* was detected, but at low levels that are not cause for concern (Kutz et al. 2015).

Warming trends in the Arctic are responsible for longer summers associated with a rise in insect harassment (First Joint Meeting 2015; Russell and Gunn 2016). This trend has been observed since the 1970's (Thorpe et al. 2001; Dumond et al. 2007). In particular, warm and dry weather is responsible for an increase in mosquitos while warm and wet summers produce more warble flies and nose bot flies (Dumond et al. 2007). Warmer temperatures have also allowed for an increase in the number of biting flies and the length of time they are out. Indigenous Peoples have observed an increase in warble flies, nasal bot flies and mosquitos on Victoria Island; where warble flies were previously observed only in the summer, they are now being seen in the spring as well (Bates 2007; Dumond et al. 2007). In the mainland part of the range from 2000-2014, there was an increasing trend in air temperatures and accumulated heat between January and June, as well as an increasing trend in the warble fly index (based on temperature and wind) (Russell and Gunn 2016).

With this increase in insects, caribou have been seen constantly running from or shaking off swarms of insects (Kugluktuk HTO 2016). In one severe case, a community member observed caribou running non-stop, back and forth over the period of a day as they tried to seek relief (First Joint Meeting 2015). The insects can sometimes be numerous enough that the caribou are forced to move kilometres back and forth. This avoidance behaviour uses energy and prevents caribou from eating, which affects both fat stores and body condition (First Joint Meeting 2015; Kugluktuk HTO 2016; Second Joint Meeting 2016). Lack of body fat influences the ability of Dolphin and Union Caribou to become pregnant, survive water crossings, migration and the winter season. Hughes et al. (2009) found that female Dolphin and Union Caribou with a high burden of warble infestation had less fat and a lower probability of being pregnant.

5.2.5 Other habitat changes due to climate change

IUCN Threat #11.1 Habitat Shifting and Alteration (Medium - Low Impact)*

*Note - This threat as assessed includes sea ice loss, discussed above under Section 5.2.1.

There are already many observations of warming temperatures caused by climate change across the Arctic (Riedlinger and Berkes 2001; Nichols et al. 2004; Hinzman et al. 2005; Barber et al, as cited in Poole et al. 2010; IPCC 2014; First Joint Meeting 2015) and warmer

summer temperatures have been documented in the range of Dolphin and Union Caribou (Poole et al. 2010). The impacts of climate change on Dolphin and Union Caribou include sea ice loss (discussed in Section 5.2.1) increased insect harassment, and changes to diseases and parasites (both discussed in Section 5.2.4). There has been very little assessment of other changes to Dolphin and Union Caribou habitat, but changes to vegetation could impact the population, since the timing and amount of forage available influences body mass, pregnancy rates and survival (Thomas 1982; Heard 1990; Gerhart et al. 1997; Thorpe et al. 2001).

The warming trend in the Arctic has created a measurable increase in plant productivity (Normalized Difference Vegetation Index, or NDVI) across the western Arctic Islands (Barber et al. 2008; Walker et al. 2011). Changes in plant growth on the tundra were noticed by participants in an IQ study in the 1990s. They found that the vegetation on Victoria Island was becoming more diverse and plentiful with warming temperatures (Thorpe et al. 2001). Such observations suggest that more and better forage may be increasingly available on Victoria Island for caribou. However, in TK interviews conducted from 2011-2013 in Ulukhaktok, poor plant growth linked to dry conditions and freezing was raised as a concern for caribou (Ulukhaktok TK interviews 2011-2013).

Overall, the impacts of climate change on vegetation are complex and there is currently not enough information available to determine whether the cumulative impacts from climate change will generally prove positive or negative for Dolphin and Union Caribou.

5.2.6 Icing events

IUCN Threat #11.4 Storms and Flooding (Medium – Low impact)

Freeze-thaw events and freezing rain can make a layer of ice on the ground or snow that covers vegetation and makes it inaccessible to foragers (Elias 1993; Ulukhaktok TK interviews 2011-2013). Since only part of the range is affected, these events are localized and may affect only a portion of the population. Where there are large areas affected by icing events, Dolphin and Union Caribou have to live off their fat reserves or move elsewhere, and may perish from starvation (Elias 1993; Thorpe et al. 2001; Ulukhaktok TK interviews 2011-2013). Researchers sometimes associate the years of frequent icing events with a reduction in caribou numbers and fewer harvesting opportunities (Thorpe et al. 2001). For example, in the winter of 1987-88 Cambridge Bay hunters reported freezing rain and caribou dying along the coast; caribou carcasses were later found that appeared to have been malnourished (Gunn and Fournier 2000).

There are indications that icing events are becoming more common in the Dolphin and Union Caribou range. Knowledge holders from the Bathurst Inlet area interviewed by Thorpe et al. (2001) reported an increase in the frequency of freezing rain and freeze-thaw cycles in the 1990s, and some knowledge holders from Ulukhaktok recently reported that freezing rain was happening more now than in the past (Ulukhaktok TK interviews 2011-2013). Scientists have also expressed concern that icing events will become more

frequent since climate change models predict warmer temperatures and greater precipitation in the Arctic (e.g., Rinke and Dethloff 2008; Vors and Boyce 2009; Festa-Bianchet et al. 2011). As such, icing events have the potential to become a serious threat to Dolphin and Union Caribou.

5.2.7 Mining

IUCN Threat #3.2 Mining and Quarrying (Low Impact)*

*Note - This threat as assessed does not include roads, flights or shipping associated with mines. These are considered under IUCN Threats numbers: 4.1 - Roads and railroads, 4.3 – Shipping Lanes, 4.4 – Flight paths and 6.3 – Work and other activities.

Industrial development, particularly mining and activities related to mining, have been identified as a threat to Dolphin and Union Caribou. There are mining exploration projects located in their winter range and one mine is currently entering its operational phase. There is evidence that mining impacts caribou distribution on a local and regional scale as caribou respond to industrial projects by selecting habitat at increasing distances up to the estimated zone of influence (area of reduced caribou occupancy) (Boulanger et al. 2012). Even a small spatial disturbance can have a major effect on caribou (Forbes et al. 2001) and impacts appear to be more important during the calving and pre-calving period (Weir et al., 2007; Dyer et al., 2001; Nellemann et al., 2001). Some research has indicated a decrease in reproductive rates associated with an increase in industrial activities due to habitat alteration, loss or fragmentation (Nellemann et al. 2003). If mines are developed or expanded, they could impact caribou movements, displace caribou from winter foraging sites, and increase access for hunting (SARC 2013). Future mining projects and possible expansion of current mining activities have the potential to disrupt migration corridors and winter feeding grounds (Tuktoyaktuk Community Meeting 2014; First Joint Meeting 2015; Ekaluktutiak HTO 2016; Olohaktomiut HTC 2016; Paulatuk HTC 2016; Second Joint Meeting 2016). Once industrial operations cease, concerns may be raised during site cleanups; for example, a caribou was seen with barbed wire from an old Distant Early Warning (DEW) line site caught in its antlers (First Joint Meeting 2015). Although the overall impact of mines to Dolphin and Union Caribou was assessed as low, it was recognized that a higher percentage of the caribou population may be directly affected by mines in the future (Appendix A).

5.2.8 Roads

IUCN Threat #4.1 Roads and Railroads (Low Impact)

Roads currently have a very small effect on the Dolphin and Union Caribou population, but they could become more of an issue within the next 10 years if the mines and associated roads that are currently being proposed are developed. For example, KIA and the Government of Nunavut have proposed a mine with an all-weather road ending at

Grays Bay, west of Bathurst Inlet; the transportation system is known as the Grays Bay Road and Port Project (GBRP). Once completed, it will include 227 km of road connecting the rich mineral resources of Canada to the Arctic shipping routes.

Permanent or temporary roads such as winter roads may influence the spring migration by crossing the caribou migration route (Olohaktomiut HTC 2016). A proposed road to connect mines to a new port in Bathurst Inlet could also impact caribou (Back River Project 2015). Even a single road in the range of Dolphin and Union Caribou could be encountered by a large proportion of the caribou population. Roads also allow increased access for hunters – something that has proven to be a serious issue for other caribou (Vistnes and Nellemann 2008; J. Adamczewski Wildlife Biologist, Ungulates, GNWT, ENR, pers. comm. 2016) and for animals in general (Benítez-López et al. 2010).

Combined with direct mortality, there could be indirect effects from roads, such as changes to caribou movements, and/or displacement from winter foraging sites (SARC 2013). Disturbances such as vehicles can increase energetic costs for caribou if the disturbances interrupt caribou feeding or cause them to move away (Weladji and Forbes 2002).

5.2.9 Flights

This section refers to scheduled flights [IUCN #4.4] and flights for other purposes such as research, outfitting and industrial activities [IUCN #6.3].

Caribou are not necessarily disturbed by all air traffic, but low-level aircraft flights and the associated noise can disturb them and lead to increased energetic costs (Weladji and Forbes 2002; First Joint Meeting 2015; Ekaluktutiak HTO 2016; Olohaktomiut HTC 2016; Second Joint Meeting 2016;). Community members have voiced concern over aircraft, emphasizing that flights, particularly around mining sites, are already bothering Dolphin and Union Caribou. Some communities note there appears to be an increase in unscheduled aircraft and helicopter flights, and they have voiced unease about the impacts in terms of flight frequency, height and noise (Ekaluktutiak HTO 2016; Kugluktuk HTO 2016; Olohaktomiut HTC 2016). Communities are also worried about industry failing to respect guidelines (Ekaluktutiak HTO 2016; Kugluktuk HTO 2016; Olohaktomiut HTO 2016; Second Joint Meeting 2016). It has been suggested that flights should be at high altitude over calving areas or should not be allowed at all where caribou are calving (SARC 2013; First Joint Meeting 2015; Ekaluktutiak HTO 2016; Kugluktuk HTO 2016; Second Joint Meeting 2016).

From 2010 to 2014, the average number of airplane and helicopter takeoffs and landings per day at airports was 3.7 in Ulukhaktok, 9.1 in Kugluktuk, and 14.1 in Cambridge Bay (Statistics Canada 2014). This statistic does not include flights taking off from other locations such as field camps and mine sites.

IUCN Threat #4.4 Flight Paths (Low Impact)*

*Note - This threat as assessed includes scheduled flights only.

An increase in mining activities may result in more scheduled flights, which could increase the level of disturbance to Dolphin and Union Caribou. In the future, scheduled flights to mines could outnumber flights to communities, although flights would be mostly at high altitude and would disturb caribou during takeoff and landing. Caribou may also be disturbed if current flight paths for scheduled flights were altered to overlap with calving areas.

IUCN Threat #6.3 Work and Other Activities (Negligible Impact)

Helicopters and fixed-wing aircraft used by surveyors, mine workers, outfitters, the military, and researchers can be disruptive to Dolphin and Union Caribou, particularly during the calving season. Flights around mine sites to move equipment and workers, and conduct other mine-related work, creates disturbance, and flights around field camps to carry out research can also be disruptive to Dolphin and Union Caribou.

5.2.10 Other threats

A number of other possible threats were considered and deemed to have unknown impact, negligible impact, or no direct effect at the present time (i.e. impact not calculated by the IUCN threat calculator). These threats are explored in Appendix A, with the following results. Airborne pollutants were thought to have no direct effect at the present time and introduced genetic material was thought to have an unknown impact although some exchange with mainland herds had occurred. Recreational activities / housing and urban areas / utilities and service lines had a negligible impact. Garbage and solid waste / oil and gas drilling / war, civil unrest and military exercise did not calculate an impact.

5.3 Knowledge Gaps

There are knowledge gaps about Dolphin and Union Caribou that need to be addressed to assist in management. The key knowledge gaps are listed below.

High Priority:

1. Population/demography: Demographic information such as pregnancy, survival and recruitment rates are all important indicators of population trend that can inform management decisions. These data are lacking for Dolphin and Union Caribou.

2. Health of caribou, including disease parasites, toxicology and contaminant load. This would also include examining transfer of disease through migratory bird droppings and/or insects. Research was conducted in 2015 on caribou health, including disease

and parasites; the results of this research should be analyzed and reported, and monitoring of caribou health should continue.

3. Harvest: In order to establish an appropriate harvest rate that allows for a self-sustaining population, accurate harvest data is necessary. Harvest reporting is currently not mandatory so precise harvest numbers, including sex ratio, are unknown. Therefore, accurate harvest data is needed in order to determine appropriate harvest rates by local communities.

4. Predator-prey relationships: There has been very little research carried out on the relationship between Dolphin and Union Caribou and their predators (wolves and grizzly bears). Scientific information is lacking on predation rates and how predators affect Dolphin and Union Caribou at the population level. It was agreed that further research should be carried out on these relationships (First Joint Meeting 2015).

5. Potential impact of future development on Dolphin and Union Caribou: Since Dolphin and Union Caribou winter in an area of high mineral potential where future mine sites and roads may be built, knowledge should be gathered focusing on the impact of these potential developments on herd resilience and population trend.

Medium Priority:

6. Vegetation changes and diet: Climate change may impact Dolphin and Union Caribou through changes to vegetation including the timing, growth, and types of plants. These changes are not well understood. There is also a need for more information on the diet of Dolphin and Union Caribou, to better understand these changes.

7. Changes to insect population and distribution: Climate change may lead to an increase in insect harassment, transfer of disease through insects and potentially the establishment of new insect species in Dolphin and Union Caribou range. Research on these topics would be helpful for understanding the potential impacts on Dolphin and Union Caribou.

Low Priority:

8. Competition: Concerns have been raised about the impacts of muskoxen and over-abundant geese on Dolphin and Union Caribou and their habitat. More research examining the impacts of these interactions would assist in managing Dolphin and Union Caribou.

9. Interbreeding: There has been concern expressed over potential interbreeding between Dolphin and Union Caribou and other subspecies and populations of caribou. There is very little research on the degree of interbreeding (if any) and its possible impacts. More knowledge on this topic would benefit Dolphin and Union Caribou.

6. MANAGEMENT

6.1 Management Goal

Recognizing the ecological, cultural and economic importance of Dolphin and Union Caribou, the goal of this management plan is to maintain the long term persistence of a healthy and viable Dolphin and Union Caribou population that moves freely across its current range and provides sustainable harvest opportunities for current and future generations.

6.2 Management Objectives

There are five objectives for the management of Dolphin and Union Caribou. These objectives apply broadly across the population's range in both NWT and Nunavut. They are listed in Table 5 in no particular order.

Table 5. Management objectives

Objective 1	Adaptively co-manage Dolphin and Union Caribou using a community-based approach.
Objective 2	Communicate and exchange information on an ongoing basis between parties using a collaborative and coordinated approach.
Objective 3	Collect information to fill knowledge gaps on Dolphin and Union Caribou using IQ and TK, community monitoring and scientific methods.
Objective 4	Minimize disturbance to habitat and preserve sea ice crossings to maintain the ability of Dolphin and Union Caribou to move freely across their range.
Objective 5	Ensure management is based on population level so future generations can benefit from sustainable harvesting opportunities.

6.3 Approaches to Management of the Dolphin and Union Caribou

This management plan recommends the approaches discussed below (Table 6) to achieve the management objectives. It provides additional information for each management approach including the relative priority, time frame, threats and/or knowledge gaps addressed, and performance measures and indicators. More specific recommended actions under each approach are provided in Appendix B. All management partners will need to work collaboratively on these approaches, and depending on the partner's mandate, some could work more closely on specific approach(es) or action(s). Individual community level plans and/or HTO/HTC initiatives can also be carried out to implement these approaches.

Table 6. Approaches to management of the Dolphin and Union Caribou.

Objective	Management Approaches	Threats and/or knowledge gaps addressed	Relative Priority[8] / Time frame[9]	Performance Measures[10]
Objective #1: **Adaptively co-manage Dolphin and Union Caribou using a community-based approach.**	1.1 Hold regular meetings with co-management partners, Indigenous governments and organizations, and local harvesting committees to make recommendations on Dolphin and Union Caribou management, and to implement these recommendations,	Enables adaptive management. • Potential to address all threats and provide information on all knowledge gaps	Critical / Ongoing	• Co-management partners share IQ, TK, local and scientific knowledge with each other on an ongoing basis. • All co-management partners review and discuss management practices & recommendations through attending regular meetings.

[8] **Relative priority** can be *critical, necessary* or *beneficial.* Critical approaches are the highest priority for the conservation of Dolphin and Union Caribou and should be implemented sooner rather than later. Necessary approaches are important to implement for the conservation of Dolphin and Union Caribou but with less urgency than critical. Beneficial approaches help to achieve management goals but are less important to the conservation of the species compared to critical or necessary.

[9] **Relative timeframe** can be short-term, long-term, or ongoing. Short-term approaches should be completed within five years (2023) and long-term approaches require more than five years to complete (2028). Ongoing approaches are long-term actions carried out repeatedly on a systematic basis

[10] **Performance Measures:** This table represents guidance from all partners as to the priority of the approaches and appropriate measure of performance.

Objective	Management Approaches	Threats and/or knowledge gaps addressed	Relative Priority[8] / Time frame[9]	Performance Measures[10]
	using co-management processes and adaptive management principles.			
Objective #2: **Communicate and exchange information on an ongoing basis between parties using a collaborative and coordinated approach.**	2.1 Encourage flow and exchange of information between management partners, communities, industry, regulatory boards, non-governmental organizations (NGOs), and the public, using various approaches to promote better understanding of Dolphin and Union Caribou and the threats they face.	• Potential to address all threats and provide information on all knowledge gaps	Necessary/ Ongoing	• Community members such as teachers, elders, and others detect an increased knowledge level by youth regarding traditional hunting practices and overall Dolphin and Union Caribou management. • Knowledge level of industry and regulatory boards increases with respect to Dolphin and Union Caribou management, by considering Dolphin and Union Caribou in project proposals. • Knowledge level of public increases with regard to Dolphin and Union Caribou (possibly via NGO public education). • More communities share harvesting information with one another. • Increase in information collected and information products (e.g., e-mails/ pamphlets/presentations) available to managers and communities.
Objective #3: **Collect information to fill knowledge gaps on Dolphin and Union Caribou using IQ and TK, community monitoring and scientific methods.**	3.1 Monitor Dolphin and Union Caribou population number, distribution, and demographic indicators to determine population level and trend.	Enables adaptive management **Knowledge Gaps:** • Population/ demography • Harvest • Predator-Prey relationships • Interbreeding	Critical / Ongoing	• Maintain a long term monitoring program for population level, distribution and demographic indicators; trends in population are monitored using IQ, TK, local knowledge and scientific methods. • Increase in monitoring information that is collected. • Increased knowledge with respect to knowledge gaps.

Objective	Management Approaches	Threats and/or knowledge gaps addressed	Relative Priority[8] / Time frame[9]	Performance Measures[10]
	3.2 Improve our overall understanding of Dolphin and Union Caribou health, biology and habitat requirements, diet, and effects of climate change.	Enables adaptive management **Threats:** • Habitat changes due to climate change • Predation and competition (muskoxen and geese) • Parasites, diseases and insect harassment • Changes to sea ice affecting migration **Knowledge Gaps:** • Health of caribou • Predator-prey relationships • Potential impacts of future development • Vegetation changes and diet • Changes to insect population and distribution • Competition from muskoxen and geese	Critical / Ongoing	• Increase knowledge of how climate change, parasites, diseases, insects, muskoxen/geese competition, and interbreeding impact the Dolphin and Union Caribou population. • Increase co-management partner knowledge of these impacts on Dolphin and Union Caribou and of their biology through meetings and information products.
	3.3 Assess cumulative impacts on Dolphin and Union Caribou population and habitat.	• Potential to address all threats and provide information on all knowledge gaps	Necessary/ Ongoing	• Cumulative effects model is developed and used.
	3.4 Co-ordinate the gathering of information and research among	• Potential to address all threats and provide	Necessary/ Ongoing	• Increase in number of collaborative research projects carried out.

Objective	Management Approaches	Threats and/or knowledge gaps addressed	Relative Priority[8] / Time frame[9]	Performance Measures[10]
	different co-management partners and research institutions.	information on all knowledge gaps		• Results shared with co-management partners. • Relevant information compiled.
Objective #4: **Minimize disturbance to habitat and preserve sea ice crossings to maintain the ability of Dolphin and Union Caribou to move freely across their range.**	4.1 Monitor changes to habitat from anthropogenic and natural disturbances on an ongoing basis.	**Threats:** • Changes to sea ice affecting migration • Mining • Roads • Predation and Competition (geese and muskoxen) **Knowledge Gaps:** • Potential impacts of future development • Vegetation changes and diet (climate change) • Competition (geese and muskoxen)	Critical / Ongoing	• Information on changes to habitat (natural and man-made) is collected and shared frequently with co-management partners.
	4.2 Proactively work with marine/ industry/transportation organizations and regulators to minimize human and industrial disturbance and seek ways to preserve sea ice crossings.	**Threats:** • Changes to sea ice affecting migration (climate change, shipping, ice-breaking) • Mining • Roads • Flights **Knowledge Gaps:** • Vegetation changes and diet (climate change)	Critical / Ongoing	• Potential partners and mechanisms are identified for collaborative work on appropriate actions listed under 4.2, including seeking ways to preserve sea ice crossings. • Guidelines, standard advice and best practices are developed, accepted, and used, including during project reviews. • Dolphin and Union Caribou concerns are brought forward in regulatory processes. • Dolphin and Union Caribou habitat needs are incorporated into land use planning (including terrestrial and marine areas).

Objective	Management Approaches	Threats and/or knowledge gaps addressed	Relative Priority[8] / Time frame[9]	Performance Measures[10]
	4.3 Manage populations of other species that affect Dolphin and Union Caribou habitat.	**Threats:** • Predation & Competition (geese, muskoxen) **Knowledge Gaps:** • Competition (geese and muskoxen)	Necessary/ Short Term	• Decrease in populations of overabundant species (e.g., geese). • Periodic reports on population level of overabundant species.
Objective #5: Ensure management is based on population level so future generations can benefit from sustainable harvesting opportunities.	5.1 Obtain accurate harvest data.	**Threats:** • Harvesting beyond a sustainable rate **Knowledge Gaps:** • Population/ demography • Health of caribou (disease, toxicology and contaminant load) • Harvest • Interbreeding	Critical / Ongoing	• Increased awareness among community members of the importance of reporting accurate and complete harvest data. • Accurate harvest data is collected and shared among all co-management partners. • Increased awareness and use of caribou sample kits among harvesters. Basic kits could ask for information on the date/location of harvest, assessment of body condition, measurements of back fat depth, skin, hair and feces collection etc.
	5.2 Manage harvesting activities within acceptable limits using adaptive management techniques included in Section 6, to ensure that harvesting opportunities are available in the future and treaty rights are fully respected.	**Threats:** • Harvesting beyond a sustainable rate **Knowledge Gaps:** • Population/ demography • Harvest	Critical / Ongoing	• Refine and adapt Dolphin and Union Caribou harvest management guidance as new information becomes available. • Recommendations on harvest management are put forward to the respective wildlife management boards and territorial Minister for decision and potential implementation.
	5.3 Manage predators using adaptive management techniques included in Section 6 as a natural and necessary part of the ecosystem.	**Threats:** • Predation and Competition	Necessary / Ongoing	• Development and delivery of hunter education and training takes place that focuses on harvesting of wolves and proper handling of hides.

Objective	Management Approaches	Threats and/or knowledge gaps addressed	Relative Priority[8] / Time frame[9]	Performance Measures[10]
	(Note that establishing specific actions of a predator management program, and implementing such a program is beyond the scope of this management plan.)	**Knowledge Gaps:** • Predator/Prey relationships		

6.4 Approaches to Achieve Objectives

Some of the threats to Dolphin and Union Caribou such as climate change, pollution and contaminants are broad in scope and cannot be directly addressed by this management plan. Since these range-wide threats are caused by humankind, national and international cooperation and collaboration should be promoted to help mitigate them. The impact of these threats on Dolphin and Union Caribou should be highlighted through the appropriate regional, national and international fora. In addressing these threats, all management partners will need to work collaboratively and can choose to work on approaches and actions that are most suitable for their particular organisation's mandate.

Objective #1:

Adaptively co-manage Dolphin and Union Caribou using a community-based approach.

Approaches to achieve Objective #1:

1.1 Hold regular meetings with co-management partners, Indigenous governments and organizations, and local harvesting committees to make recommendations on Dolphin and Union Caribou management, and to implement these recommendations using co-management processes and adaptive management[11] principles. (All Knowledge Gaps).

The natural environment is always changing; accordingly, threats may change and a species' reaction to these threats may also change. Using adaptive management practices allows managers to cope with these changes. Regular meetings, rotating among NWT and Nunavut communities, would provide a strong foundation for adaptive management. These meetings would allow co-management partners to jointly review the most up-to-date information on the state of Dolphin and Union Caribou, and the results of new research. The management plan will be reviewed at least every five years but more frequent reviews and meetings in NWT and Nunavut communities could take place when needed (Ekaluktutiak HTO 2016; Olohaktomiut HTC 2016). This would help to work towards a management plan that is used, and where management actions are adjusted as necessary. Regular trans-boundary meetings of the management partners are recommended. Continuing to work collaboratively with Inuit and Inuvialuit governments and organizations, wildlife management boards, communities, harvesters and industry is essential to adapt management practices. Just as IQ, TK and local knowledge form the

[11] Adaptive management is a systematic approach for continually improving management policies or practices by deliberately learning from the outcomes of management actions

foundation of this management plan, management partners should help ensure this knowledge continues to be brought to the decision-making table and guides the management of Dolphin and Union Caribou. This is reiterated by Indigenous Peoples since, as they point out, they are the main voice for wildlife in the communities (Ekaluktutiak HTO 2016; Paulatuk HTC 2016; Olohaktomiut HTC 2016). One harvester mentioned that the Dolphin and Union Caribou Management Plan was a good example of collaborative co-management (Paulatuk HTC 2016).

Objective #2:

Communicate and exchange information on an ongoing basis between parties using a collaborative and coordinated approach.

Approaches to achieve Objective #2:

2.1 Encourage flow and exchange of information between management partners, communities, industry, regulatory boards, non-governmental organizations (NGOs), and the public, using various approaches to promote better understanding of Dolphin and Union Caribou and the threats they face. (All Knowledge Gaps).

Nunavut and NWT communities, management partners, elders, hunters, youth, industry and the public each have a role to play in management of Dolphin and Union Caribou. Exchanging information helps all parties to appreciate their roles and responsibilities and helps to build and maintain support for the successful management of Dolphin and Union Caribou. It also helps ensure that all perspectives are integrated into management, and that caribou managers are aware of on-the-ground matters such as the population and health status of the caribou and the state of its habitat.

A variety of methods can be used to communicate information. For example, meetings with industry can be held, and within communities, outreach and education can take place through various meetings and workshops with co-management partners. Outreach can also happen more informally through one-on-one communication between community members and staff employed in co-management organizations. Other methods of outreach may be used depending on the demographic, such as home visits, school visits, social media, and out on the land trips.

These community venues can be used to teach hunters about recognizing disease and parasites in caribou, how to determine if meat is edible and how to prepare it accordingly (Kugluktuk HTO 2016). To further alleviate concern over diseased caribou and its impacts on human health, communities have suggested that harvesters bring back a tissue sample to the conservation officer or regional biologist to test for parasites and/or disease when anomalies are observed (Ekaluktutiak HTO 2016; Olohaktomiut HTC 2016). The suggestion was also made that hunters should take a disease/parasite booklet with them while out on the land (Kugluktuk HTO 2016). Other communication links can be built by supporting community monitoring programs and by finding ways to work with industry on contributing information to research and monitoring.

Objective #3:

Collect information to fill knowledge gaps on Dolphin and Union Caribou using IQ and TK, community monitoring and scientific methods.

Approaches to achieve Objective #3

3.1 Monitor the Dolphin and Union Caribou population number, distribution, and demographic indicators to determine population level and trend. (Knowledge Gaps #1, 3, 4, 9).

3.2 Improve our overall understanding of Dolphin and Union Caribou health, biology and habitat requirements, diet, and effects of climate change. (Knowledge Gaps #2, 4, 5, 6, 7, 8).

3.3 Assess cumulative impacts on Dolphin and Union Caribou population and habitat. (All Knowledge Gaps).

3.4 Co-ordinate the gathering of information and research among different co-management partners and research institutions. (All Knowledge Gaps).

There has been limited information available on the population abundance and trends of Dolphin and Union Caribou, but the development of a research program can provide the foundation to answer the defined knowledge gaps, such as the recent collaring and surveying of the population in Nunavut in 2015. Managers can build on this information through continued monitoring of population size and trend, including important demographic indicators such as survival (particularly females), pregnancy rates and calf recruitment; this information should be shared with communities (Ekaluktutiak HTO 2016). Geographic areas of importance to Dolphin and Union Caribou, including their preferred migratory sea ice routes, would also be identified through this initiative.

At the time of writing this document (2015-2016), research on Dolphin and Union Caribou health including disease, parasites and contaminants is taking place and initial analyses have been completed. Some impacts from climate change include changes in vegetation growth and insect harassment, and research examining these impacts should be promoted. A better understanding of Dolphin and Union Caribou diet is needed to understand these impacts. Expanding community-based monitoring programs that provide information on Dolphin and Union Caribou, such as caribou sampling kits, will also improve knowledge on health, condition, diet, population trends and predators.

Inuit and Inuvialuit have voiced concern that wolf populations appear to be increasing in Dolphin and Union Caribou range, and to some extent grizzly bears (First Joint Meeting 2015; Second Joint Meeting 2016). However, there is little scientific information available on predator abundance or how predators impact Dolphin and Union Caribou populations. Management would benefit from an improved understanding of predator abundance and the relationship between Dolphin and Union Caribou and their predators. Dolphin and

Union Caribou also interact with other herbivores such as other barren-ground caribou, muskoxen and geese. A stronger understanding of how these interactions affect Dolphin and Union Caribou and their habitat would assist in managing this population.

Threats may have low or negligible impacts by themselves, but can have a significant effect when they are combined. A cumulative effects model would be a valuable tool to help managers understand the relative importance of different pressures on Dolphin and Union Caribou and how they ultimately determine the state of the population. Such a model can also be used in the co-management process (Objective #1) to help predict the consequences of different management scenarios and to develop more effective mitigation measures.

Knowledge gaps should be prioritized and addressed by all parties to work toward a collaborative and coordinated approach to research and monitoring activities. Some questions can be addressed through community-based monitoring and surveys, while other research questions can be explored through partnerships with academic researchers or other agencies. Documenting IQ, TK and local knowledge on a continuing basis is expected and can help to fill knowledge gaps and inform management. Industry may also provide a potential source of data for management of Dolphin and Union Caribou. Local communities should also be informed and kept up-to-date on the collected data including numbers, body condition and overall health (Ekaluktutiak HTO 2016).

Objective #4:

Minimize disturbance to habitat and preserve sea ice crossings to maintain the ability of Dolphin and Union Caribou to move freely across their range.

Approaches to achieve Objective #4

4.1 Monitor changes to habitat from anthropogenic and natural disturbances on an ongoing basis. (Knowledge Gaps #5, 6, 8).

4.2 Proactively work with marine/industry/transportation organizations and regulators to minimize human and industrial disturbance and seek ways to preserve sea ice crossings. (Knowledge Gap #6).

4.3 Manage populations of other species that affect Dolphin and Union Caribou habitat. (Knowledge Gap #8).

Monitoring habitat change, which includes sea ice, will allow management partners to keep track of the degree to which Dolphin and Union Caribou habitat has been disturbed, both by climate change and more direct industry-based activities including ice-breaking activities, shipping and mining exploration. This is a key step in ensuring that Dolphin and Union Caribou needs are taken into account by organizations (e.g, Department of Fisheries and Oceans, Transport Canada, or the Nunavut Marine Council) in decision-making about shipping activities and land use, having due regard for existing, pending and future

interests in land allowed under territorial land legislation and precedent. A collective approach with all relevant management partners is required in decision-making about land use, including land use planning.

Some communities say that shipping should not be allowed through the Northwest Passage from freeze-up to break-up; in other words, during the fall, winter or spring (Ekaluktutiak HTO 2016; Second Joint Meeting 2016). Seeking out and collaborating with different authorities such as government agencies, community organizations, shipping companies, tourism operators and industry will be required in order to minimize disturbance to Dolphin and Union Caribou and fragmentation of their habitat. A better understanding about authorities that manage ship traffic is needed to inform this collaboration. Some communities have expressed concern that industry is not following guidelines or respecting important identified caribou habitat (Ekaluktutiak HTO 2016; Kugluktuk HTO 2016; Olohaktomiut HTC 2016; Paulatuk HTC 2016). As such, guidelines, standard advice and best practices related to aircraft, shipping, tourism, and industry should be developed including, if necessary, amendments to existing legislation. These should be promoted and then followed by monitoring and an evaluation of compliance with these guidelines and practices.

Management of other species that may affect Dolphin and Union Caribou, such as muskoxen or overabundant geese, requires collaboration with all levels of governments. Promoting harvest of overabundant species such as geese may assist in reducing habitat destruction.

Objective #5:

Ensure management is based on population level so future generations can benefit from sustainable harvesting opportunities.

Approaches to achieve Objective #5

5.1 Obtain accurate harvest data. (Knowledge Gaps #1, 2, 3, 9).

5.2 Manage harvesting activities within acceptable limits using adaptive management techniques included in Section 6, to ensure that harvesting opportunities are available in the future and treaty rights are fully respected. (Knowledge Gaps #1, 3).

5.3 Manage predators using adaptive management techniques included in Section 6 as a natural and necessary part of the ecosystem. (Knowledge Gap #4).

This objective focuses on ensuring a long term harvest of Dolphin and Union Caribou by beneficiaries and other harvesters. While carefully considering the limitations on harvest data (Section 5.2.3), the population level, trend, demographic indicators (all from Objective #3) and harvest rate should be considered in determining appropriate harvest management, as outlined in Section 6.6. Other management in addition to harvest should

also be adaptively informed by population level and trend, as described within the approaches under Objective #1 and in Section 6.6.

The collection of accurate, complete and reliable harvest data, which includes the number of caribou harvested and the sex ratio, is crucial. This can be achieved by proactively working with local harvesting committees and other groups to estimate harvest levels of Indigenous hunters. This has typically proven to be a difficult task; therefore educating communities on the importance of reporting is an essential part of this approach. Estimated total harvest levels should be reported annually to caribou management authorities, HTOs/HTCs, and co-management partners, as the importance of communities remaining informed with respect to new data has been highlighted (Ekaluktutiak HTO 2016). With this data, an appropriate harvest rate can be determined.

With information on population level and trend, demographic indicators, and harvest rate, co-management partners can follow the processes outlined for wildlife management in land claims. Management partners should annually review harvest information and population information, to manage harvesting activities within acceptable limits that allow for a viable, self-sustaining caribou population. This approach would use different management techniques that correspond to different stages of the caribou population cycle, as discussed in further detail in Section 6.6: *Managing based on Population Level.* If it appears they are not doing so, then management partners may have to consider management recommendations (such as harvesting limits) to achieve the management goals.

Responsible harvesting practices that minimize negative impacts on the Dolphin and Union population should be promoted to sustain harvest for future generations. This includes teaching youth and inexperienced hunters about responsible harvesting practices and good marksmanship, since elders are noticing many wounded caribou from young and inexperienced hunters (Second Joint Meeting 2016). In this situation, actions should be community-based (Ekaluktutiak HTO 2016): by integrating IQ and TK into the school system and/or taking youth/inexperienced hunters out on the land, more experienced harvesters could assist in teaching them about traditional harvesting practices. Traditional practices focus on avoiding harvest of both cows with calves, and the leaders of herds, good marksmanship, ability to distinguish types of caribou, and avoiding wastage of meat. Less experienced hunters would also benefit from learning about the harvest of prime bulls during sport hunts and its negative impacts on the health of the population (Kugluktuk HTA 2016). Hunters also suggest to avoid leaving gut piles out on the land to curb the attraction of wolves (Olohaktomiut HTC 2016). Promoting harvest of alternative species that are available can also provide an option in reducing harvest of Dolphin and Union Caribou.

Establishing specific actions of a predator management program, and implementing such a program is beyond the scope of this management plan. However, educating and training hunters about how to harvest predators can help with managing predators as a natural and necessary part of the Dolphin and Union Caribou's ecosystem. At the time of writing this

plan, Inuit communities in Nunavut may harvest wolves legally with no harvest limits, provided they follow the rules of the *Nunavut Wildlife Act*. In NWT, the Inuvialuit may also lawfully harvest wolves with no harvest limits or conditions (NWT Summary of Hunting Regulations 2015), provided that they follow wastage provisions in the *NWT Wildlife Act*. At the first joint meeting in Kugluktuk, it was agreed that further research on predator-prey relationships is needed to inform management (First Joint Meeting 2015).

6.5 Current Management and Other Positive Influences

Positive influences on Dolphin and Union Caribou are factors likely to promote population growth. These can be classified into two main categories: 1) management actions that are being implemented; and 2) positive environmental changes (such as an increase in vegetation) that may promote population growth.

Current management

In the NWT and Nunavut, there are some measures in place that assist in managing Dolphin and Union Caribou, including land claim agreements, legislation, regulations, community conservation plans, and land use planning. The collaborative, responsive co-management regimes set up under land claims have a positive influence on Dolphin and Union Caribou because they allow for concerns to be addressed through adaptive management with participation from all partners.

NWT

Co-management regime

The comprehensive land claim affecting the Western Arctic Region of the Northwest Territories was settled in 1984. The settlement was passed into federal law and is known as the Inuvialuit Final Agreement (IFA). In the NWT portion of the Inuvialuit Settlement Region (ISR), wildlife is managed in accordance with section 14 of the IFA. This section defines the principles of wildlife harvesting and management, identifies harvesting rights, and explains the co-management process and conservation principles. It defines the structure, roles, and responsibilities of the Wildlife Management Advisory Council (NWT) (WMAC (NWT)), governments, the Inuvialuit Game Council (IGC), the Inuvialuit HTCs, the Environmental Impact Screening Committee (EISC) and the Environmental Impact Review Board (EIRB). WMAC (NWT) is responsible for listening to concerns raised about wildlife and addressing these concerns through the use of the adaptive management model, which allows management of a species to be adapted according to new circumstances.

Harvest management

In the NWT, big game hunting regulations help to manage the harvest of Dolphin and Union Caribou (NWT Summary of Hunting Regulations 2015). There are harvest limits applied to NWT residents, meaning Canadian citizens or landed immigrants who have been living in the NWT for at least a year, but who are not beneficiaries of the IFA. At the time of

publication of this document, hunting season for NWT residents runs from August 15th to November 15th and residents are allowed two bulls. For non-residents and non-Canadians, there is a sport hunting season from August 15th to October 31st and hunts must be guided; however there are currently no tags allocated for non-resident and non-Canadian hunters, so sport hunting is not taking place (WMAC (NWT), pers. comm. 2016). There are presently no restrictions or limitations on Indigenous harvest of Dolphin and Union Caribou in the NWT.

Other conservation plans

Conservation priorities for the NWT portion of the range have been formalized through Inuvialuit Community Conservation Plans. The Olohaktomiut (Ulukhaktok) Community Conservation Plan (OCCP, 2008) identifies a number of specific areas important to Dolphin and Union Caribou on northwestern Victoria Island and recommends that those "lands and waters shall be managed so as to eliminate, to the greatest extent possible, potential damage and disruption". The Plan also recommends other actions that could bring positive results for Dolphin and Union Caribou. These include:

- Identify and protect important habitats from disruptive land uses.
- Share your harvest with others in the community.
- Do not harvest more than is needed.
- Harvest on sustainable basis, and in a manner consistent with recommendations of the HTC.
- The HTC will encourage a voluntary ban on caribou hunting where required.
- A management plan for Victoria Island Caribou will be developed.

The IFA allows for land use planning (s.7.82), which can be pursued by communities within the ISR if desired.

Nunavut

Co-management regime

In Nunavut, wildlife is managed according to Article 5 of the NLCA. Article 5 sets out the creation of the NWMB, which is the primary instrument of wildlife management in Nunavut. Article 5 defines the roles of the NWMB, Government, HTOs, and the Regional Wildlife Organization (RWO) which is the KRWB in the Kitikmeot Region. In Nunavut, each of the co-management partners fulfills its respective role as defined in the NLCA.

Harvest management

The *Nunavut Wildlife Act*, an additional management tool, sets out harvest management, licensing, reporting and sample submission.

According to the NLCA, Dolphin and Union Caribou are listed under schedule 5-1 as big game. Because TAH is not set on this population, Inuit have the right to harvest to the full

level of their economic, social, and cultural needs. As long as there is no conservation concern, Article 5 is constitutionally protected and trumps all other harvesting rules or regulations for Inuit.

The GN treats each caribou population, regardless of spatial overlap, separately and distinctly for TAH recommendations. Non-beneficiaries, within three months of residency, have an open hunting season to legally harvest five caribou per person per year with a valid hunting license; however during their first two years as residents of Nunavut, non-beneficiaries must hunt with a guide.

In addition, harvest is regulated via a tag system available for sport hunts. The previous NWT Big Game regulations (grandfathered into Nunavut legislation when Nunavut was established), set a limit of 35 barren-ground caribou sport hunting tags on Victoria Island and the Kent Peninsula on the mainland (R-118-98, Dated 14 August, 1998). These tags were shared by Kugluktuk and Cambridge Bay. Although the Kugluktuk HTO made a motion to suspend all caribou commercial and sport hunts for all herds, sport hunting for non-residents (Canadian and non-Canadian) continues to take place in the fall based out of Cambridge Bay. The main outfitter for sport hunts for Dolphin and Union Caribou is the Ekaluktutiak HTO, which allows up to two barren-ground caribou (including Dolphin and Union Caribou) per person through an outfitter. There is currently no commercial harvest of Dolphin and Union Caribou. No maximum hunting limits on barren-ground caribou exist for beneficiaries.

Other conservation plans

In the Nunavut portion of the range, the *Nunavut Land Use Plan* is currently under development and contains conservation measures for Dolphin and Union Caribou. Although the public hearing process is not yet complete and the plan is not finalized, it provides recommendations to regulatory authorities to mitigate the impacts of shipping traffic on spring and fall caribou sea ice crossings (Nunavut Planning Commission 2016).

Communities, HTOs and government have been working with industry to limit the impacts of human activities on Dolphin and Union Caribou. For example, the Cambridge Bay HTO made recommendations regarding seasonal restrictions on shipping and at least one mining company has made a voluntary commitment to limit shipping to the open water season (Ekaluktutiak HTO 2016; Second Joint Meeting 2016). Some mining companies have also created flight rules to minimize their impact on caribou.

During the 1940s and 1950s, Inuit tried to reduce geese populations by picking white-fronted and snow geese eggs, always ensuring that they left two eggs; if fewer eggs were left, the geese would lay even more (First Joint Meeting 2015). This practice is still in effect, as families come back each spring with the intent of taking eggs (First Joint Meeting 2015; Second Joint Meeting 2016).

Environmental changes

Warming temperatures in the Arctic are changing the vegetation and presumably changing the availability of forage for Dolphin and Union Caribou (see Section 5.2.5). The relationships between local conditions (e.g., precipitation, air temperature), forage and population trend can be complex (e.g., Ozful et al. 2009) and it is unknown to what degree any positive effects of climate change may or may not offset the negative effects.

6.6 Managing Based on Population Level

Many caribou populations/herds vary naturally in abundance (Zalatan et al. 2006; Bergerud et al. 2008; Parlee et al. 2013) and there is still uncertainty about the parameters of the Dolphin and Union Caribou cycle. Similar cycles occur in other wildlife and the causes of these cycles are not known definitively, but predators, disease, vegetation and weather each play a role (Caughley and Gunn 1993, Krebs 2009). The interaction of these variables and/or their cumulative impacts may also play a role in population cycles. Based on hunters' observations, the last low in the Dolphin and Union Caribou population cycle seems to have occurred in the mid-1900s (Nishi and Gunn 2004), and the last high occurred around 1997 (Tomaselli et al. 2016a, 2018), with a declining trend indicated in the 2015 population assessment (Leclerc and Boulanger in prep.). The necessary historical data to accurately determine the natural range of variation of the Dolphin and Union Caribou may be lacking, but there is now sufficient research to determine whether Dolphin and Union Caribou have been increasing, stable or decreasing in the last 19 years (see Section 4.4 for details).

While developing this management plan, co-management partners discussed how management actions should vary depending on where the Dolphin and Union Caribou population is in its cycle. As a result, certain management actions are recommended below for each population phase. These are intended as advice for decision-makers and a starting point for management. Co-management partners would still follow their decision-making process as outlined in the NLCA and IFA in order to implement management actions.

6.6.1. Determining population status

A population cycle can be divided into 4 phases: high, declining, low and increasing (Figure 9). All co-management partners agreed that the Dolphin and Union Caribou cycle involved these four phases. IQ, TK, local knowledge and science were used to define the thresholds and to outline parameters that allow co-management partners to determine when the population is in each phase of the cycle. Although Figure 9 focuses on population levels, other indicators may be considered when establishing the status of Dolphin and Union Caribou. These would include demographic indicators, such as number of calves, recruitment, survival (particularly females), pregnancy rates, and environmental indicators (e.g., climate change, disease, anthropogenic pressure). Climate change will have an indirect, but underlying influence on some of these indicators.

High:

The population is considered in the high status when it is above 60% of the highest recorded population estimates. For Dolphin and Union Caribou, this is considered to be above 24,000 as the last population peak of the Dolphin and Union Caribou population was about 40,000. From the low number of caribou observed by community members in the 1950s, the corrected 1997 population estimate represented this first scientifically measured high for the Dolphin and Union population (Nishi and Gunn 2004). The peak, therefore set at 40,000, represents the high end of the confidence interval of the 1997 population estimate. At this phase, the population migrates in large numbers between Victoria Island and the mainland. The population can sustain a greater harvest rate and the range is at its maximum.

Declining:

The declining phase represents between 20% and 60% of the highest population estimate, with a declining trend. It is at the point when the population reaches approximately 24,000 Dolphin and Union Caribou, that concerns about the population trend should be raised. The combination of negative anthropogenic and environmental factors could accelerate the rate of decline in the population. Management recommendations to slow down the decrease in population should be put forward at this point.

Low:

The population is considered to be in the low phase when it is below 20% of the highest population estimate, which would represent a population estimate of under 8,000 Dolphin and Union Caribou. During this phase, the Dolphin and Union Caribou population is at greater risk of overharvesting and its range is greatly contracted to the point where migration between Victoria Island and the mainland may stop. Minimizing harvesting and human impact on habitat would reduce pressure on this population and could help increase the recovery rate of the population.

Increasing:

The increasing phase would be between 20% and 60% of the highest population estimate (between 8,000 and 24,000 caribou) with an increasing trend. Caribou abundance and range expands during this phase and the demographic indicators will show a positive trend. If Dolphin and Union Caribou have halted their sea ice crossing during the declining and low phases, it is during this phase that the migration between Victoria Island and the mainland could resume.

As new pertinent information becomes available, it is recommended that co-management partners plan a joint meeting to suggest a change from one phase to the next phase (Figure 9). At a minimum, every 5 years, all the new information should be collected and considered to review the population level and trend.

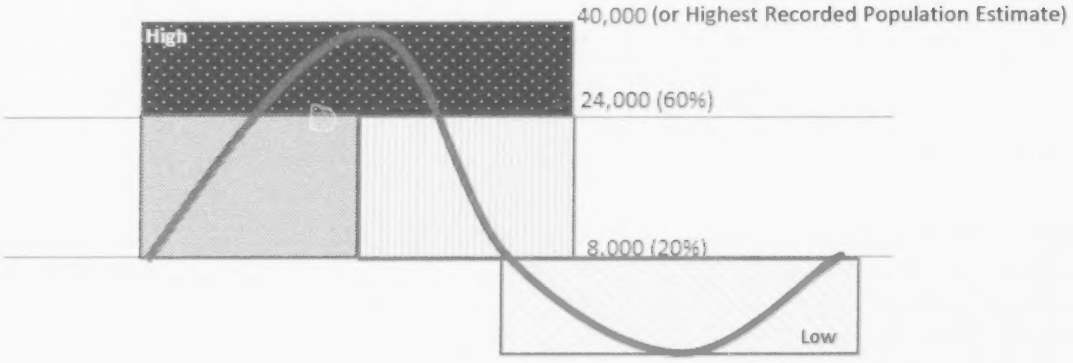
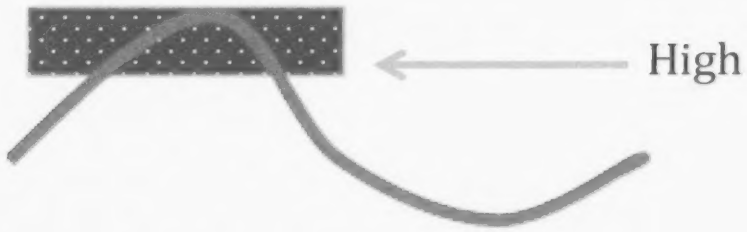


Figure 9. Dolphin and Union Caribou cycles: Determining the location of the Dolphin and Union Caribou population within its cycle. The Dolphin and Caribou population cycle is unpredictable and may vary due to changing magnitude and impact of threats.

6.6.2. Management actions recommended

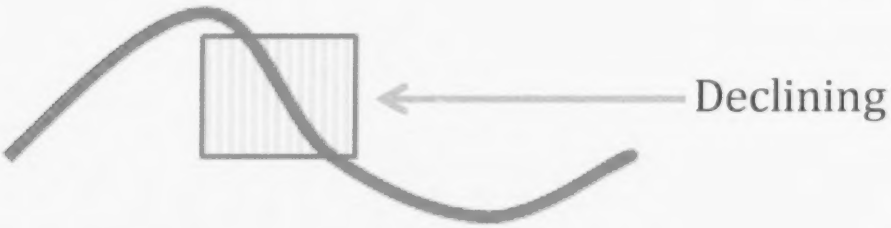
Despite the information gaps with respect to population status, basic management principles can still be applied to maintain a healthy sustainable caribou population. Co-management partners realize the need to use the best available information for managing Dolphin and Union Caribou. The management actions taken, and the point at which they are taken, depend on where the population is in its cycle. Managers should also be mindful of maintaining the population within its natural levels of variation.

Development of this plan required extensive discussion about management actions. For each phase of the Dolphin and Union Caribou cycle, the co-management partners came to an agreement to recommend certain actions, including harvest management to reflect potential conservation issues. These actions were developed by co-management partners at the Second Joint Meeting (2016) and reviewed and revised through consultation with all the communities, HTOs/HTCs that harvest Dolphin and Union Caribou, and other co-management partners (Ekaluktutiak HTO 2016; Kugluktuk HTO 2016; Olohaktomiut HTC 2016; Paulatuk HTC 2016). These actions are described below.



High Status:

- Educate harvesters and youth on how to harvest respectfully and how to harvest alternative species that are available.
- No harvest restrictions on beneficiaries.
- Consider other types of harvests based on community and land claims, including the use of commercial harvest to control over-population.
- Support reporting of harvest and community-based monitoring programs.
- Conduct research and monitoring; have sample kits to monitor harvest.
- Encourage research on predators and ease management of predators.
- Working group of stakeholders meets.
- Industry activities should meet a baseline standard and follow their wildlife monitoring and mitigation plan.



Declining status:

- Educate and integrate information into the school system on topics including: the importance of using the whole caribou, how to hunt alternative wildlife, and harvest of predators.
- No harvest restriction on beneficiaries.
- Consider harvest restriction on non-beneficiaries, such as no resident, outfitter or commercial harvest.
- Consider setting non-quota limitation; e.g., bull-dominated (selecting younger and smaller bulls), limited harvest of females (such as 5% cow harvest), or seasonal limits.
- Support reporting of harvest and community-based monitoring program.

- Increase research and monitoring; have sample kits to monitor harvest.
- Encourage research on predators, and manage predators as a natural and necessary part of the ecosystem, based on the jurisdiction's needs.
- Working group of stakeholders should meet more frequently.
- Consider adding more restrictions on industry activities that affect caribou.

Low Status:

- Educate and integrate information into the school system on topics including: the importance of using the whole caribou, how to hunt alternative wildlife, and harvest of predators.
- Educate people on new restrictions and management that may be in place.
- Consider establishing effective mandatory mechanisms to reduce overall harvest, as appropriate for the community (e.g., TAH). Mechanisms would be reviewed to determine if more reductions are needed.
- Resident, non-resident, outfitter or commercial harvest remain closed.
- Consider removing non-quota limitation; e.g., bull-dominated (selecting younger and smaller bulls), limited harvest of females (such as 5% cow harvest), or seasonal limits.
- Harvest from alternative healthy populations of wildlife available.
- Support reporting of harvest and community-based monitoring program.
- Increase research and monitoring; have sample kits to monitor harvest.
- Encourage research on predators, and manage predators as a natural and necessary part of the ecosystem, based on the jurisdiction's needs.
- Working group of stakeholders should meet more frequently.
- Consider stricter restrictions for industry activities that affect caribou.

Increasing Status:

- Educate harvesters and youth on how to harvest respectfully and how to harvest alternative species that are available.
- Educate on the restriction and management in place.
- Consider removing the TAH.
- Easing of harvest restrictions and consider implementing non-quota limitation.
- Support report of harvest and community-based monitoring program.
- Conduct research and monitoring; have sample kits to monitor harvest.
- Encourage research on predators and ease management of predators.
- Working group of stakeholders meets.
- Industry activities should meet a baseline standard and follow their wildlife monitoring and mitigation plan.

These recommended management actions respect how Inuit and Inuvialuit have been managing wildlife for hundreds of years and take into consideration input and knowledge from the community members of each harvesting community. However, co-management partners can take action to help the Dolphin and Union Caribou at any time, using their powers and responsibilities laid out in land claim agreements (for example, the ability of HTOs and HTCs to make by-laws; see Section 2.2). There is a need for increased community involvement in the management and regulation of harvest and land use for Dolphin and Union Caribou. If communities choose to implement their own restrictions, they are still encouraged to discuss these restrictions with other co-management partners.

The recommended management actions are intended as advice for decision-makers. Co-management partners would still follow the decision-making processes outlined in the NLCA and IFA in order to implement them.

7. MEASURING PROGRESS

The performance indicators presented below provide a way to define and measure progress toward achieving the management goal (Section 6.1)

- The status of Dolphin and Union Caribou has not become threatened or endangered when reassessed by SARC every 10 years, and by COSEWIC every 10 years.
- The Dolphin and Union Caribou population allows for continued subsistence harvests.

- Dolphin and Union Caribou move freely throughout their range on Victoria Island and the mainland.

In addition to these performance indicators, the performance measures set out in Table 6 will provide pertinent information to assess interim progress towards achieving the ultimate management goal.

8. NEXT STEPS

Management partners will use this plan to help in assigning priorities and allocating resources in order to manage human impacts on Dolphin and Union Caribou. This management plan will be reviewed every five years and may be updated. At least every five years, there will be a report on the actions undertaken to implement the plan and the progress made towards meeting its objectives.

9. REFERENCES

Adjun, C. 1990. Appendix D: Local knowledge in Holman on wolf numbers, behaviour and distribution. Pp. 39-41 in A. Gunn (2005). The decline of caribou on Northwest Victoria Island: a review. Government of the Northwest Territories, Draft File Report. Yellowknife, NT. 68 pp.

Advisory Committee for Cooperation on Wildlife Management. 2016. Action Plan for the Bluenose-East Caribou Herd – Orange Status. Yellowknife, NT (unpublished).

Armitage, P. and S. Kilburn. 2015. Conduct of Traditional Knowledge Research—A Reference Guide. Wildlife Management Advisory Council (North Slope), Whitehorse, YT. xiv + 97 pp.

Back River Project, Final Environmental Impact Statement: Main Volume. 2015. Sabina Gold and Silver Corp. Vancouver, BC. pp. 181.

Badringa, R.W. 2010. Inuvialuit Nautchiangit: relationships between people and plants. Inuvialuit Cultural Resource Centre, Inuvik, NT. 320 pp.

Barber, D.G., J.V. Lukovich, J. Keogak, S. Baryluk, L. Fortier and G.H.R. Henry. 2008. The changing climate of the Arctic. Arctic 61 (Suppl. 1): 7-26.

Bates, P. 2007. Inuit and scientific philosophies about planning, prediction and uncertainty. Arctic Anthropology 44: 87-100.

Batt, B.D.J. (Ed.). 1997. Arctic ecosystems in peril: report of the Arctic Goose Habitat Working Group. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C. and Canadian Wildlife Service, Ottawa, ON. 120 pp. Available at: http://www.agjv.ca/images/stories/pdf/arcticecosystemsinperil.pdf [Accessed April 2016].

Benítez-López, A., R. Alkemade and P. A. Verweij. 2010. The impacts of roads and other infrastructure on mammal and bird populations: A meta-analysis. Biological Conservation: 143(6): 1307-1316.

Brink, J.W. 2005. Inukshuk: Caribou drive lanes on southern Victoria Island, Nunavut, Canada. Arctic Anthropology 42: 1-18.

Bergerud, A. T., S. N. Luttich and L. Camps. 2008. The return of the caribou to Ungava. McGill-Queen's University Press. Montréal, QC. 586 pp.

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

Boulanger, J., K.G. Poole, A. Gunn, and J. Wierzchowski. 2012. Estimating the zone of influence of industrial developments on wildlife: a migratory caribou *Rangifer tarandus groenlandicus* and diamond mine case study. Wildlife Biology. 18 (2): 164-179. doi: https://doi.org/10.2981/11-045

Canadian Coast Guard. 2014. Northern marine transportation corridors initiative. Company of Master Mariners of Canada, Canadian Coast Guard, Fisheries and Oceans Canada. Available at: http://www.mastermariners.ca/maritimes/uploads/05marinecorridors.pdf [Accessed April 2016].

Canadian Environmental Assessment Agency and Privy Council Office. 2010. Strategic environmental assessment: The cabinet directive on the environmental assessment of policy, plan and program proposals - Guidelines for implementing the cabinet directive. Canadian Environmental Assessment Agency, Government of Canada. Ottawa, ON. 13 pp.

Canadian Wildlife Service (CWS) Waterfowl Committee. 2014. Migratory Birds Regulations in Canada, July 2014. CWS Migratory Birds Regulatory Report Number 43. 48 pp. Available at: https://www.ec.gc.ca/rcom-mbhr/F74028E2-ED36-420C-80F6-E29C31CDC458/CWS%202014%20July%20report%20hunting%20regulatiosn%20E.pdf [Accessed June 2016].

Canadian Wildlife Service (CWS) Waterfowl Committee. 2015. Population Status of Migratory Game Birds in Canada – November 2015. CWS Migratory Birds Regulatory Report Number 45. Available at: https://www.ec.gc.ca/rcom-mbhr/default.asp?lang=En&n=9DB378FC-1# 2 36 [Accessed June 2016].

CARMA (CircumArctic Rangifer Monitoring & Assessment Network). 2012. CircumArctic Rangifer Monitoring & Assessment Network. Available at: http://carma.caff.is [Accessed May 2016].

Caughley, G. and A. Gunn. 1993. Dynamics of large herbivores in Deserts: kangaroos and caribou. Oikos 67(1): 47-55.

Charnley, S., A.P. Fischer, E.T. Jones. 2007. Integrating traditional and local ecological knowledge into forest biodiversity conservation in the Pacific Northwest. Forest Ecology and Management 246: 14-28.

Committee on the Status of Endangered Wildlife in Canada. 2004. COSEWIC assessment and update on the Peary caribou Rangifer tarandus pearyi and barren-ground caribou Rangifer tarandus groenlandicus Dolphin and Union population in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON. 101 pp.

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

Committee on the Status of Endangered Wildlife in Canada. 2011. Designatable Units for caribou (*Rangifer tarandus*) in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON. 88 pp.

Dumond, M. et al. (13 co-authors). 2007. Western Kitikmeot caribou workshop. Iqaluit, Nunavut. Government of Nunavut, Department of Environment, Final Wildlife Report No. 19. 47 pp.

Dumond, M. 2013. Briefing Note for information to the Nunavut Wildlife Management Board. Issue: Dolphin and Union Caribou Herd. February 12, 2013.

Dumond, M. and D. S. Lee. 2013. Dolphin and Union caribou herd status and trend. Arctic 66: 329-337.

Dumond, M., S. Sather, and R. Harmer. 2013. Observation of Arctic island barren-ground caribou migratory movement delay due to human induced sea ice breaking. Rangifer 33, Special Issue 21: 115-121.

Dyer, S.J., J.P. O'Neill, S.M. Wasel, and S. Boutin. 2001. Avoidance of industrial development by woodland caribou. Journal of Wildlife Management 65: 531-542.

Eger, J.L., T.P. Birt, A. Gunn, and A.J. Baker. 2009. Genetic diversity and history of Peary caribou (*Rangifer tarandus*) in North America. Pp. 73-101 *in* K. McFarlane, A. Gunn and C. Strobeck. 2009. Proceedings from the caribou genetics and relationships workshop. Edmonton, Alberta, 8-9 March 2003. Government of the Northwest Territories, Environment and Natural Resources, Yellowknife, NT. Manuscript Report No 183. 171 pp.

Ekaluktutiak HTO. 2016. Summary of Hunters and Trappers Organization and public meeting for the draft Dolphin and Union Caribou management plan - April 19, 2016. Canadian Wildlife Service unpublished report, Cambridge Bay, NU.

Elias, A. 1993. Appendix A: Survey of elders' traditional knowledge of caribou in the Holman area. Pp. 23-28 *in* A. Gunn (2005). The decline of caribou on Northwest Victoria Island: a review. Government of the Northwest Territories Draft File Report. Yellowknife, NT. 68 pp.

Environment Canada. 2013. Planning for a sustainable future: A federal sustainable development strategy for Canada 2013-2016. Environment Canada. 93 pp.

Environment and Natural Resources. 2015a. Summary of harvest data for species under quota in the Inuvialuit Settlement Region, July 2010 to June 2015. Wildlife Management Advisory Council (NWT and North Slope) and Inuvialuit Game Council. Inuvik, NT. 46 pp.

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

Environment and Natural Resources. 2015b. State of the Environment Report: 7. Human Activities: Trends in shipping in the Northwest Passage and the Beaufort Sea. Available at: http://www.enr.gov.nt.ca/state-environment/73-trends-shipping-northwest-passage-and-beaufort-sea [Accessed April 2016].

Environment and Natural Resources. 2016. State of the Environment Report: Highlights 2016. Government of the Northwest Territories, Yellowknife, NT. 17 pp.

Festa-Bianchet, M., J.C. Ray, S. Boutin, S.D Cote and A. Gunn. 2011. Conservation of caribou (Rangifer tarandus) in Canada: an uncertain future. Canadian Journal of Zoology 89: 419-434.

First Joint Meeting for Dolphin and Union Caribou Management Plan. Kugluktuk, NU. March 25 – 27, 2015. Summary of discussions prepared by Government of Nunavut. Unpublished report.

Fisheries Act (R.S.C., 1985, C. F-14). Available at: http://laws-lois.justice.gc.ca/eng/acts/f-14/

Forbes, B.C., J.J. Ebersole and B. Strandberg. 2001. Anthropogenic disturbance and patch dynamics in circumpolar ecosystems. Conservation Biology 15: 954–969.

Gamberg, M. 2008. Contaminants in Arctic moose and caribou 2006. Technical Report, Gamberg Consulting, Whitehorse, YT. 21 pp.

Gamberg, H. 2016. Contaminants in Arctic Caribou. Presented at 2016 Cambridge Bay Joint Meeting for Dolphin Union Caribou Management Plan – January 11 - 13, 2016.

Gerhart, K.L., R.G. White, R.D. Cameron, D.E. Russell and D. van der Wetering. 1997. Pregnancy rate as an indicator of the nutritional status in Rangifer: Implications of lactational infertility. Rangifer 17: 21-24.

Golder Associates Ltd. 2003. Report on Inuit qaujimajatuqangit literature, GAP analysis and workshop results related to the Doris North project, Hope Bay belt, Nunavut. Submitted to Miramar Hope Bay Limited, North Vancouver, B.C., November 13, 2003, Victoria, British Columbia.

Government of Nunavut. 2013. Summary of the Southampton Island Barren-ground Caribou Population Management Plan 2011-2013. Government of Nunavut, Nunavut. 9 pp.

Gunn, A. 1990. The decline and recovery of caribou and muskox on Victoria Island. Pp. 590-607 *in* R. Harington (ed.) Canada's missing dimension: science and history in the Canadian Arctic Islands.. Canadian Museum of Nature, Ottawa, ON.

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

Gunn, A. 2005. The decline of caribou on northwest Victoria Island 1980-93. File Report No. 133. Department of Resources, Wildlife and Economic Development, Government of the Northwest Territories, Yellowknife, NT. 68 pp.

Gunn, A. 2008. Migratory tundra caribou. Pp. 200-239 *in* M. Hummel and J.C. Ray (eds.). Caribou and the North: a shared future. Dundurn Press, Toronto, ON. 288 pp.

Gunn, A., A. Buchan, B. Fournier and J. Nishi. 1997. Victoria Island caribou migrations across Dolphin and Union Strait and Coronation Gulf from the Mainland Coast, 1976-94. Department of Resources, Wildlife and Economic Development, Government of the Northwest Territories, Manuscript Report No. 94. 74 pp.

Gunn, A. and B. Fournier. 2000. Caribou herd delimitation and seasonal movements based on satellite telemetry on Victoria Island 1987-89. Department of Resources, Wildlife and Economic Development, Government of the Northwest Territories, File Report No. 125. 104 pp.

Gunn, A., and J. Nishi. 1998. Review of information for Dolphin and Union caribou herd, Victoria Island. Pp. 1-22 *in* A. Gunn, U. S. Seal, and P. S. Miller (eds). Population and habitat viability assessment workshop for the Peary caribou (*Rangifer tarandus pearyi*)-Briefing Book. Apple Valley, Minnesota, Conservation Breeding Specialist Group (SSC/IUCN).

Gunn, A. and B.R. Patterson. 2012. Distribution and abundance of muskoxen on south-eastern Victoria Island, Nunavut, 1988-1999. Department of Resources, Wildlife and Economic Development, Government of the Northwest Territories, Yellowknife, NT. Manuscript Report No. 221.

Gunn, A. and J. Adamczewski. 2003. Muskox. Chapter 50 *in* G. Feldhamer, B.A. Chapman, and J.A. Chapman (eds.). Wild Mammals of North America. The Johns Hopkins University Press, Baltimore, MD. 1216 pp.

Heard, D.C. 1990. The intrinsic rate of increase of reindeer and caribou in Arctic environment. Rangifer 10 (Special Issue 3): 169-173.

Hinzman, L.D. et al. (33 co-authors). 2005. Evidence and implications of recent climate change in northern Alaska and other arctic regions. Climatic Change 72(3): 251-298.

Hughes, J.R. 2006. The influence of forage and parasites on the migration of the Dolphin and Union caribou herd. PhD thesis. University of Aberdeen, Scotland, UK.

Hughes, J., S.D. Albon, R.J. Irvine and S. Woodin. 2009. Is there a cost of parasites to caribou? Parasitology 136: 253-265.

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

International Union for Conservation of Nature and Conservation Measures Partnership (IUCN and CMP). 2006. IUCN – CMP unified classification of direct threats, ver. 1.0 – June 2006. Gland, Switzerland. 17 pp. Available at: http://www.conservationmeasures.org/initiatives/threats-actions-taxonomies/threats-taxonomy [Accessed April 2016].

Inuvialuit Harvest Study. 2003. Inuvialuit Harvest Study: Data and Methods Report 1988-1997. Joint Secretariat, Inuvik, NT. 202 pp. Available at: http://www.screeningcommittee.ca/pdf/harvest_study.pdf [Accessed April 2016].

IPCC (Intergovernmental Panel on Climate Change). 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Joint Secretariat. 2015. Inuvialuit and nanuq: A polar bear traditional knowledge study. Joint Secretariat, Inuvialuit Settlement Region. Xx + 304 pp. Available online: http://www.wmacns.ca/pdfs/394_polar-bear-tk-report-low-res.pdf [Accessed March 2016].

Kafle, P., L. Leclerc, M. Anderson, T. Davison, M. Lejeune, and S. Kutz. Morphological keys to advance the understanding of protostrongylid biodiversity in caribou (*Rangifer spp.)* at high latitudes. International Journal of Parasitology: Parasites and Wildlife. In review.

Krebs, C.J. 2009. Population dynamics of large and small mammals: Graeme Caughley's grand vision. Wildlife Research 36: 1-7.

Kugluktuk HTO. 2016. Summary of Hunters and Trappers Organization and public meeting for the draft Dolphin and Union Caribou management plan - April 28, 2016. Canadian Wildlife Service unpublished report, Kugluktuk, NU.

Kutz, S J., E P. Hobert, P K. Molnar, A. Dobson, and G.G. Verocai. 2014. A walk on the tundra: Host-parasite interactions in an extreme environment. International Journal for Parasitology: Parasites and Wildlife 3(2):198-208.

Kutz, S., P. Kafle, A. McIntyre, and A. Carlsson. 2015. Summary report of the preliminary results of health analyses for caribou collared in the Kitikmeot. Presented at 2016 Cambridge Bay Joint Meeting for Dolphin Union Caribou Management Plan – January 11 - 13, 2016.

Larter, N.C. and J.A. Nagy. 2001. Variation between snow conditions at Peary caribou and muskox feeding sites and elsewhere in foraging habitats on Banks Island in the Canadian High Arctic. Arctic, Antarctic, and Alpine Research 33: 123-130.

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

Larter, N.C., J.A. Nagy, and D.S. Hik. 2002. Does seasonal variation in forage quality influence the potential for resource competition between muskoxen and Peary caribou on Banks Island? Rangifer 22: 143-153.

Leclerc, L. and J. Boulanger. Fall Population Estimate of the Dolphin and Union Caribou herd (*Rangifer tarandus groenlandicus* x *pearyi*), Victoria Island, October 2015, and Demographic Population Indicators 2015-2017. In prep.

Macdonald C.R, L.L. Ewing, B.T. Elkin, and A.M. Wiewel. 1996. Regional variation in radionuclide concentrations and radiation doses in caribou (*Rangifer tarandus*) in the Canadian Arctic; 1992-94. Science in the Total Environment 182: 53-73.

Manning, T.H. 1960. The relationship of the Peary and barren-ground caribou. Arctic Institute North America Technical Paper No. 4: 1-52.

McFarlane, K., A. Gunn and C. Strobeck. 2009. Proceeding from the caribou genetics and relationships workshop. Edmonton, Alberta, 8-9 March 2003. Government of the Northwest Territories, Environment and Natural Resources, Yellowknife, NT. Manuscript Report No 183. 171 pp.

McFarlane, K., A. Gunn, M. Vampbell, M. Dumond, J. Adamczewki and G. A. Wilson. 2016. Genetic diversity, structure and gene flow of migratory barren-ground caribou (*Rangerfer tarandus groenlandicus*) in Canada. Rangifer 36(1):1-24

Migratory Birds Convention Act, 1994 (S.C. 1994, c. 22). Available at: http://laws-lois.justice.gc.ca/eng/acts/m-7.01/

Miller, F. 2003. Caribou (*Rangifer tarandus*). Pp. 965-997 *in* G.A. Feldhamer, B.C. Thompson, and J.A. Chapman (eds.). Wild Mammals of North America. 2nd edition. Johns Hopkins University Press, Baltimore, MD.

Miller, F. L., and A. Gunn. 2003. Status, population fluctuations and ecological relationships of Peary caribou on the Queen Elizabeth Islands: Implications for their survival. Rangifer 23 (Special Issue 14): 213-226.

Miller, F.L., S.J. Barry, and W.A. Calvert. 2005. Sea ice crossings by caribou in the south-central Canadian Arctic Archipelago and their ecological importance. Rangifer 25 (Special Issue 16): 77-88.

NatureServe. 2015. NatureServe explorer: An online encyclopedia of life [web application]. Version 7.1. http://explorer.natureserve.org [Accessed March 2016].

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

Nellemann, C., I. Vistnes, P. Jordhoy and O. Strand. 2001. Winter distribution of wild reindeer in relation to power lines, roads and resorts. Biological Conservation 101: 351-360.

Nellemann, C., I. Vistnes, P. Jordhoy and O. Strand. 2003. Progressive impact of piecemeal infrastructure development on wild reindeer. Biological Conservation 113: 307-317.

Nichols, T., F. Berkes, D. Jolly, N.B. Snow and The Community of Sachs Harbour. 2004. Climate Change and Sea ice: Local Observations from the Canadian Western Arctic. Arctic 57(1): 68-79. Available at: http://www.jstor.org/stable/40512596 [Accessed May 2016].

Nishi, J.S. 2000. Calving and rutting distribution of the Dolphin and Union caribou herd based on radio-telemetry, Victoria Island (1994-1997). Department of Resources, Wildlife and Economic Development, Government of the Northwest Territories, Kugluktuk, NT. Manuscript Report No. 127. 80 pp.

Nishi, J. S. and A. Gunn. 2004. An estimate of herd size for the migratory Dolphin and Union caribou herd during the rut (17 - 22 October 1997). Northwest Territories Department of Resources, Wildlife and Economic Development File Report 131, Yellowknife, Northwest Territories. 51 pp.

NWT (Northwest Territories) Summary of Hunting Regulations, July 1, 2015 to June 30, 2016. Environment and Natural Resources, Yellowknife, NT. Available at: http://www.enr.gov.nt.ca/en/services/hunting-licence/nwt-hunting-guide

Nunavut Planning Commission. 2016. Nunavut Land Use Plan. Nunavut. Draft prepared 2016. 89 pp. Available at: http://www.nunavut.ca/files/2016DNLUP/2016_Draft_Nunavut_Land_Use_Plan.pdf

NWMB (Nunavut Wildlife Management Board). 2004. The Nunavut Wildlife Harvest Study, Feb 2004. Prepared by Heather Priest. Nunavut Wildlife Management Board. 816 pp. Available at: http://www.nwmb.com/inu/publications/harvest-study/1824-156-nwhs-report-2004-156-0003/file [Accessed April 2016].

Nunavut Wildlife Act. SNu 2003, c. 26. Available at: https://www.canlii.org/en/nu/laws/stat/snu-2003-c-26/latest/snu-2003-c-26.html

NWT Wildlife Act. S.N.W.T. 2013, c.30. Available at: https://www.justice.gov.nt.ca/en/files/legislation/wildlife/wildlife.a.pdf

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

Olohaktomiut Community Conservation Plan. 2008. Olohaktomiut Community Conservation Plan. The Community of Ulukhaktok, Wildlife Management Advisory Council (NWT) and Joint Secretariat.

Olohaktomiut HTC. 2016. Summary of Hunters and Trappers Committee and public meeting for the draft Dolphin and Union Caribou management plan – April 20, 2016. Canadian Wildlife Service unpublished report, Ulukhaktok, NT.

Ozful, A., D.Z. Childs, M.K. Oli, K.B. Armitage, D.T. Blumstein, L.E. Olson, S. Tuljapurkar and T. Coulson. 2009. The dynamics of phenotypic change and the shrinking sheep of St. Kilda. Science 325: 464-467.

Parlee, Brenda, N. Thorpe and T. McNabb. 2013. Traditional Knowledge: Barren-ground caribou. University of Alberta. 95 pp.

Patterson, B., unpubl. data. 2002. Survival and sustainable harvest of the Dolphin and Union caribou herd. Unpubl. report, Government of Nunavut, Cambridge Bay, NU.

Paulatuk HTC. 2016. Summary of Hunters and Trappers Committee and public meeting for the draft Dolphin and Union Caribou management plan – April 21, 2016. Canadian Wildlife Service unpublished report, Paulatuk, NT.

Poole, K. G., Anne Gunn, B. R. Patterson and M. Dumond. 2010. Sea ice and migration of the Dolphin and Union Caribou herd in the Canadian Arctic: an uncertain future. Arctic 63: 414-428.

Riedlinger, D., and F. Berkes. 2001. Contributions of traditional knowledge to understanding climate change in the Canadian Arctic. Polar Record 37: 315-328. Available at: http://archives.cerium.ca/IMG/pdf/Berkes_2001.pdf

Rinke, A. and K. Dethloff. 2008. Simulated circum-Arctic climate changes by the end of the 21st century. Global Planet Change 62(1-2): 173-186.

Russell, D. and A. Gunn. 2016. Climate trends on NWT migratory tundra caribou seasonal ranges (Excerpt April 1, 2016). Report to Environment and Natural Resources, Government of the Northwest Territories. 24 pp.

Savelle, J.M. and A.S. Dyke. 2002. Variability in Palaeoeskimo occupation on south-western Victoria Island, Arctic Canada: Causes and consequences. World Archaeology 33: 508-522.

Schaefer, J.A., S.D. Stevens and F. Messier. 1996. Comparative winter habitat use and associations among herbivores in the High Arctic. Arctic 49: 387–391.

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

Schwantje, H., B. J. Macbeth, S. Kutz, and B. Elkin. 2014. British Columbia Boreal Caribou Health Program Progress Report: Year 1 (November 1, 2013 – December 31, 2014). Unpublished report prepared for the BC Science and Community Environmental Knowledge (SCEK) Funding Board.

Second Joint Meeting for Dolphin and Union Caribou Management Plan, Cambridge Bay, NU. January 10-13, 2016. Summary of discussions prepared by Government of Nunavut. Unpublished report, Cambridge Bay, NU.

Slavik, D. 2011. Knowing Nanuut: Bankslanders Perspectives of Polar Bear Population Health. Unpublished Thesis and Transcripts.

Smith, D. R. 2006. "Foreword." In Inuvialuit Settlement Region Traditional Knowledge Report, submitted by Inuuvik Community Corporation, Tuktuuyaqtuuq Community Corporation and Aklavik Community Corporation. Submitted to Mackenzie Project Environmental Group, Calgary, Alberta. 200 pp.

Species at Risk Act (S.C. 2002, c. 29). Available at: http://laws-lois.justice.gc.ca/eng/acts/s-15.3/

SARC (Species at Risk Committee). 2012a. Species Status Report for Peary Caribou (*Rangifer tarandus pearyi*) in the Northwest Territories. Species at Risk Committee, Yellowknife, NT. 137 pp.

SARC (Species at Risk Committee). 2012b. Species Status Report for Polar Bear (*Ursus maritimus)* in the Northwest Territories. Species at Risk Committee, Yellowknife, NT. 153 pp.

SARC (Species at Risk Committee). 2013. Species Status Report for Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories. Species at Risk Committee, Yellowknife, NT. 118 pp.

Species at Risk (NWT) Act. S.N.W.T. 2009, c. 16. Available at: https://www.justice.gov.nt.ca/en/files/legislation/species-at-risk/species-at-risk.a.pdf?v9234

Staaland, H., J.Z. Adamczewski and A. Gunn. 1997. A comparison of digestive tract morphology in muskoxen and caribou from Victoria Island, Northwest Territories, Canada. Rangifer 17:17-19.

Statistics Canada. 2014. Aircraft movement Statistics: Airports Without Air Traffic Control Towers: Annual Report (TP 577). Statistics Canada, Transportation Division.

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

Catalogue no. 51-210-X. Available at: http://www5.statcan.gc.ca/olc-cel/olc.action?objId=51-210-X&objType=2&lang=en&limit=0 [Accessed June 2016].

Thomas, D.C. 1982. The relationship between fertility and fat reserves of Peary caribou. Canadian Journal of Zoology 60: 597-602.

Thorpe, N.L. S. Eyegetok, N. Hakongak, and Qitirmiut Elders. 2001. The Tuktu and Nogak Project: a caribou chronicle. Final Report to the West Kitikmeot Slave/Study Society. West Kitikmeot Slave/Study Society, Ikaluktuuttiak, NT. 198 pp. plus maps.

Thorpe, N., N. Hakongak, S. Eyegetok and the Kitikmeot Elders. 2002. Thunder on the tundra. Tuktu and Nogak Project. 208 pp.

Tomaselli, M., S. Kutz, S. Checkley, and the community of Ikaluktutiak. 2016a. Local Knowledge from Ikaluktutiak, Nunavut, on Muskoxen and Dolphin and Union Caribou. Interim Report. Presented at 2016 Cambridge Bay Joint Meeting for Dolphin Union Caribou Management Plan – January 11 - 13, 2016.

Tomaselli, M., C. Dalton, P.J. Duignan, S. Kutz, F. van der Meer, P. Kafle, O. Surujballi, C. Turcotte, and S. Checkley. 2016b. Contagious ecthyma, rangiferine brucellosis, and lungworm infection in a muskox (*Ovibos moschatus*) from the Canadian Arctic 2014. Journal of Wildlife Diseases. 52(3): 719-724. doi: http://dx.doi.org/10.7589/2015-12-327

Tomaselli, M., S. Kutz, S. Gerlach, C., Checkley, S. 2018. Local knowledge to enhance wildlife population health surveillance: Conserving muskoxen and caribou in the Canadian Arctic. Biological Conservation. 217: 337-348. doi: https://doi.org/10.1016/j.biocon.2017.11.010

Tuktoyaktuk Community Meeting 2014. Summary of public meetings for species listed under *Species at Risk (NWT) Act.* WMAC (NWT) and Inuvialuit Settlement Region HTOs and HTCs, July 2014. ENR unpublished report. Yellowknife, NT.

Ulukhaktok TK interviews 2011-2013. Presented by T. Davison at Second Joint Meeting for Dolphin and Union Caribou. Cambridge Bay, NU. January 11-13, 2016.

Upton, G. and I. Cook. 1996. Understanding Statistics. Oxford University Press, Oxford, U.K. 659 pp.

Vistnes, I. And C. Nellemann. 2008. The matter of spatial and temporal scales: a review of reindeer and caribou response to human activity. Polar Biology 31: 399-407

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

Vors, L. S. and M. S. Boyce. 2009. Global declines of caribou and reindeer. Global Change Biology 15: 2626-2633.

Walker, D.A. et al. (19 co-authors). 2011. Vegetation. In Arctic report card: update for 2011. Available at: https://www.caff.is/monitoring-series/5-arctic-report-card-2011/download

Weir, J.N., S.P. Mahoney, B. McLaren and S.H. Ferguson. 2007. Effects of mine development on woodland caribou (*Rangifer tarandus*) distribution. Wildlife Biology 13: 66-74.

Weladji, R.B. and B.C. Forbes. 2002. Disturbance effects of human activities on *Rangifer tarandus* habitat: implications for life history and population dynamics. Polar Geography 26: 171-186.

Zalatan, R., A. Gunn and G. H. R. Henry. 2006. Long-Term Abundance patters of Barren-Ground Caribou using trampling scars on roots of *Picea Mariana* in the Northwest Territories, Canada. Arctic, Antarctic and Alpine Research. 38(4): 624-630.

Zittlau, K.A. 2004. Population genetic analyses of North American caribou (*Rangifer tarandus*). PhD thesis, Department of Biological Sciences, University of Alberta, Edmonton, AB.

Information shared by individuals at joint planning workshops and at HTC/HTO meetings cannot be referenced in other documents without the expressed permission of the individual, HTC/HTO or other organization that provided the information.

APPENDIX A: IUCN THREAT CLASSIFICATION TABLE AND THREAT CALCULATOR RESULTS FOR DOLPHIN AND UNION CARIBOU

The threats classification is based on the IUCN – Conservation Measures Partnership unified threats classification system. These international standards for describing threats were utilized in order to provide consistency between different species, and improve data sharing and coordination among species at risk and other related wildlife programs. To reduce duplication of effort, GC and COSEWIC collaborated in organizing the completion of the threats calculator as it is required for both the management plan and the upcoming COSEWIC status assessment of Dolphin and Union Caribou. Co-management partners, scientific experts and representatives from the six HTOs/HTCs within the range of Peary caribou were invited to attend a teleconference to fill out the threats calculator. A training session for HTO and HTC representatives was held beforehand, and a teleconference in December 2014 as well as February 2016 were held to evaluate the threats. The teleconferences were attended by:

- Joseph Oliktoak (Olohaktomiut HTC - Ulukhaktok)
- Joeseph Illasiak and Diane Ruben (Paulatuk HTC)
- David Nivingaluk and Kevin Klengenberg (Kugluktuk HTO)
- Jimmy Haniliak, Howard Greenley and George Angohiatok (Ekaluktutiak HTO – Cambridge Bay)
- Ema Qaggutaq (KRWB)
- Tracy Davison, Lisa Worthington Suzanne Carriere and Nic Larter (GNWT)
- Lisa-Marie Leclerc and Melanie Wilson (GN)
- Justina Ray (COSEWIC Terrestrial Mammals Specialist Subcommittee Co-chair)
- Dave Fraser (COSEWIC, Government of British Columbia)
- Donna Hurlburt (COSEWIC Indigenous Traditional Knowledge Subcommittee Co-chair)
- Lee Harding (Report writer for COSEWIC)
- Kim Poole (Aurora Wildlife Research)
- Lisa Pirie, Donna Bigelow, Dawn Andrews, Amy Ganton and Isabelle Duclos (GC)
- Peter Sinkins (Parks Canada Agency)

Participants calculated an overall threat impact of Very High to High for Dolphin and Union Caribou. Threats were ranked in terms of scope, severity and timing, and the rankings were automatically rolled up into an impact for each threat as well as an overall impact.

Impact of the threat on Dolphin and Union Caribou is calculated based on scope and severity. Categories include: very high, high, medium, low, unknown, negligible.

Scope is the proportion of the population that can reasonably be expected to be affected by the threat within the next 10 years. Categories include: Pervasive (71-100%); Large (31-70%); Restricted (11-30%); Small (1-10%); Negligible (<1%); Unknown. Categories can also be combined (e.g., Large-Restricted = 11-70%).

Severity is, within the scope, the level of damage to the species (assessed as the % decline expected over the next three generations [7 years = 1 generation for Dolphin and Union Caribou]) due to threats that will occur in the next 10 years. Categories include: Extreme (71-100%); Serious (31-70%); Moderate (11-30%); Slight (1-10%); Negligible (<1%), Unknown. Categories can also be combined (e.g., Moderate to slight = 1-30%).

Timing describes the immediacy of the threat. Categories include: High (continuing); Moderate (possibly in the short term [<10 years or three generations]); Low (possibly in the long term [>10 years or three generations]); Negligible (past or no direct effect); Unknown.

Species:	Dolphin & Union Caribou (DU2)
Date:	Meeting #1: 12/08/2014; Meeting #2: 08/02/2016
Assessor(s):	Meeting #1: Justina Ray (COSEWIC), Dave Fraser (COSEWIC, BC), Suzanne Carriere (COSEWIC, NWT), Nic Larter (COSEWIC, NWT), Donna Hurlburt (COSEWIC, Aboriginal Traditional Knowledge (ATK)), Lee Harding (report writer), Tracy Davison (GNWT), Lisa Worthington (GNWT), Lisa-Marie Leclerc (GN), Melanie Wilson (GN), Donna Bigelow (GC), Dawn Andrews (GC), Lisa Pirie (GC), Kim Poole (Aurora Wildlife Research), David Nivingalok (Kugluktuk HTO), Kevin Klengenberg (Kugluktuk HTO), Ema Qaggutaq (KRWB), Joseph Oliktoak (Olohaktomiut HTC) Meeting #2: Justina Ray (COSEWIC), David Fraser (COSEWIC), Lisa-Marie Leclerc (GN), Ema Qaggutaq (KRWB), Amy Ganton (GC), Isabelle Duclos (GC), Peter Sinkins (Parks Canada Agency), Jimmy Haniliak (Ekaluktutiak HTO), Howard Greenley (Ekaluktutiak HTO), George Angohiatok (Ekaluktutiak HTO), Joshua Oliktoak (Olohaktomiut HTC), Myles Lamont (GN), Diane Ruben (Paulatuk HTC), Joe Illasiak (Paulatuk HTC).

Overall Threat Impact Calculation Help:

Threat Impact		Level 1 Threat Impact Counts: high range	low range
A	Very High	0	0
B	High	2	1
C	Medium	2	0
D	Low	1	4
Calculated Overall Threat Impact:		Very High	High

Assigned Overall Threat Impact:	**AC = Very High - High**
Overall Threat Comments:	Two threat calculator meetings were held (8/12/2014 and 8/2/2016), and results were combined

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
1	Residential & commercial development		Negligible	Negligible (<1%)	Extreme (71-100%)	High (Continuing)	
1.1	Housing & urban areas		Negligible	Negligible (<1%)	Extreme (71-100%)	High (Continuing)	Scope includes portion of species range that is alienated by human settlements plus a buffer zone for animals displaced by disturbance. There is the possibility that municipal boundaries may increase in the coming years, but this still makes the scope very low. Although very few D&U animals are or will be exposed to this threat, any that come within a certain distance of human settlements will very likely be killed, hence the high severity.
3	Energy production & mining	D	Low	Restricted (11-30%)	Slight (1-10%)		
3.1	Oil & gas drilling		Not Calculated (outside assessment timeframe)			Insignificant/ Negligible (Past or no direct effect)	No seismic activity or O&G development at present, and not expected in the foreseeable future within the D&U range
3.2	Mining & quarrying	D	Low	Restricted (11-30%)	Slight (1-10%)	High (Continuing)	The scope is currently very low, but it is plausible for this to increase with a higher percentage of the population being directly affected by mines themselves within the next 10 years. This does not include shipping, flights, or roads associated with mines, which are counted elsewhere here. Most direct mortality from the mines themselves will be very low.
4	Transportation & service corridors	B	High	Pervasive - Large (31-100%)	Serious (31-70%)	Moderate (Possibly in the short term, < 10 yrs)	
4.1	Roads & railroads	D	Low	Restricted (11-30%)	Slight (1-10%)	Moderate (Possibly in the short term, < 10 yrs)	Currently the scope is negligible but if a proposed mining project proceeds that requires an all-weather road from the coast 325 km inland, the impact of roads would greatly increase. It is possible that other development will happen in the next 10 years. It is not believed that the proposed mining project would include a network of winter roads coming off the all-weather road. Even one road, depending on

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
							where it is situated, could be encountered by a large proportion of the population. The direct impact of that road (mortality) will still be low, even if indirect effects are high.
4.2	Utility & service lines		Negligible	Negligible (<1%)	Negligible (<1%)	Unknown	
4.3	Shipping lanes	B	High	Pervasive - Large (31-100%)	Serious (31-70%)	High (Continuing)	Category includes both open water and ice-breaker shipping. Open water shipping (which currently occurs) is not an issue, rather impact is entirely from winter shipping that involves any ice breaking (including relatively thin ice that does not qualify as ice breaking by Transport Canada definitions). Currently most activity is local ice-breaking activity early season around Cambridge Bay, but occasional ships are passing through so this threat is already occurring. The current proposal for shipping out of the bottom of Bathurst inlet could affect half the D-U population. Impact of shipping depends on timing. Caribou can start crossing as early as October 15 and into December. 2-3 boats during migration could entirely stop migration and cause 40% of the animals to drown. On the other hand, the whole population doesn't cross at same time and ice can refreeze between crossings. Not every icebreaking event will cause massive fatalities.
4.4	Flight paths	D	Low	Restricted (11-30%)	Slight (1-10%)	High (Continuing)	Category is for regularly scheduled flights, i.e., to mines. The possibility of scheduled flights increasing significantly, especially when/if proposed projects start operating. Large planes to mines could be more than flights to communities. On the other hand, flights are mostly high, and only go only low for landing. Modelling work has shown relatively low direct impact. Severity is likely at the low end of slight (1-10%) range. If flight paths were to change to impact calving, the severity would increase.

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
5	Biological resource use	CD	Medium - Low	Pervasive (71-100%)	Moderate - Slight (1-30%)	High (Continuing)	
5.1	Hunting & collecting terrestrial animals	CD	Medium - Low	Pervasive (71-100%)	Moderate - Slight (1-30%)	High (Continuing)	Harvesting of Dolphin-Union caribou is unregulated. There is no hunting season or limit. Harvest levels change depending on location of caribou in a given year, and availability of other harvested species. 3 communities harvest Dolphin-Union caribou: Ulukhaktok (harvest in summer), Cambridge Bay (harvest in fall), and Kugluktuk (harvest in winter and spring when they come across the ice). There may be a shift in harvest from mainland caribou, which are in steep decline. D&U population has declined since the last surveys, but has also changed its distribution such that animals are not so accessible to these communities anymore. This will decrease harvest. Very large range of uncertainty in severity due to unknown harvest levels and uncertainty of population numbers in the future. Score for severity encompasses both worst and best case scenarios. Also, a change in distribution may expose animals to harvest elsewhere.
6	Human intrusions & disturbance		Negligible	Restricted (11-30%)	Negligible (<1%)	High (Continuing)	
6.1	Recreational activities		Negligible	Negligible (<1%)	Negligible (<1%)	High (Continuing)	
6.2	War, civil unrest & military exercises		Not Calculated (outside assessment timeframe)			Insignificant/ Negligible (Past or no direct effect)	Military exercises not a threat in this region; no seasonal overlap with D&U caribou
6.3	Work & other activities		Negligible	Restricted (11-30%)	Negligible (<1%)	High (Continuing)	Includes (primarily) research activities (e.g., surveys and capture/collaring)

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
8	Invasive & other problematic species & genes	BD	High - Low	Pervasive (71-100%)	Serious - Slight (1-70%)	High (Continuing)	
8.1	Invasive non-native/alien species	CD	Medium - Low	Large - Restricted (11-70%)	Moderate (11-30%)	High (Continuing)	This category includes all diseases and pathogens (both native and non native). Climate change expected to increase parasites and disease. Parasites increasing and expected to increase further. Lungworm increasing in muskox, but not necessarily fatal. We do have to include that we are seeing evidence that there is potential for more to occur. Biting flies are also an issue.
8.2	Problematic native species	BD	High - Low	Pervasive (71-100%)	Serious - Slight (1-70%)	High (Continuing)	This category includes all predator/competitor interactions (both native and non-native). Grizzly bears have moved into Victoria Island in the last decade or so and can have an impact on numbers. Wolves have increased on Victoria Island. Given the multi-prey interactions, predators like wolves have potential to wipe out caribou when muskox numbers are high. Impact is greater with a small population, and less when they have the opportunity to escape the predators. Severity and Scope could be high during the fall migration while they are waiting for the sea ice to form, but there is enormous uncertainty.
8.3	Introduced genetic material		Unknown	Large - Small (1-70%)	Unknown	High (Continuing)	Interbreeding with Barren-ground and Peary caribou. Although there are some claims that D&U is a hybrid (Rangifer groenlandicus x pearyi), this is not accurate. Genetics work over past decade shows Dolphin-Union as a genetically distinct population with a very small amount of Peary intergradation. A significant number of individuals would need to be inter-breeding to impact population. Communities have seen Peary caribou traveling with D&U, Barrenground traveling with D&U (more rare). Chances of hybridization are low due to the separation of the rutting grounds. Likely on the low end of both the scope and severity ranges, although the higher degree of uncertainty on severity reflects our lack of knowledge on the impacts of interbreeding. Really, particularly considering ATK, the impacts are unknown.
9	Pollution						
9.4	Garbage & solid waste						Contaminants are not currently regarded as a threat, given successful clean-up of the Dew Line.

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
11	Climate change & severe weather	CD	Medium - Low	Pervasive (71-100%)	Moderate - Slight (1-30%)	High (Continuing)	
11.1	Habitat shifting & alteration	CD	Medium - Low	Pervasive (71-100%)	Moderate - Slight (1-30%)	High (Continuing)	Category includes changes to habitat (vegetation and ice) conditions due to climate change over the next decade. Scope will affect entire population. With respect to severity, there is and will be much variability (i.e., positive and negative effect). Could get a trophic shift where there is a mismatch of greening and caribou life cycle, which could affect calving and calf survival. There is also a possibility that forage could increase with climate change. In either case, severity is not likely to be very severe. Could get a bad year or two, but will recover unless hits every year repeatedly, which is unlikely. With respect to ice, there is a small core area for Dolphin-Union, so ice conditions aren't as big a threat as they were to Peary Caribou.
11.4	Storms & flooding	CD	Medium - Low	Large (31-70%)	Moderate - Slight (1-30%)	Moderate (Possibly in the short term, < 10 yrs)	Icing events (storms) not as big an issue for Dolphin-Union as it is for Peary, and is currently unknown for D&U. Scope: Because winter range is a small area, one storm event could impact a large portion of the population. Over 3 generations, expect to be able to recover from a weather event, unless happens repeatedly year after year. Less likely to have bad weather events for multiple years in a row, which would knock back the population without a chance for recovery.

Of the threats explored in Section 5.2, a number of issues were not assessed by the threat assessment group, or were unknown / negligible / impact not calculated. Information about these threats is provided below.

IUCN Threat #9.5 Air-borne Pollutants (impact not discussed by IUCN panel but discussed at Kugluktuk and Cambridge Bay joint Dolphin and Union Caribou meetings)

Contaminants produced in other parts of the world are carried up to the Arctic by global air currents and can enter Dolphin and Union Caribou through their food (Gamberg 2016). Sampling in 1993 and 2006 found relatively low levels of organochlorine, heavy metal and radio nuclide contaminants in Dolphin and Union Caribou, although Dolphin and Union Caribou had higher mercury levels compared to the Porcupine herd of barren-ground caribou (Macdonald et al. 1996; Gamberg 2008, 2016). Some Indigenous Peoples expressed concern over potential contamination and pollution from mining sites that could affect caribou and other wildlife (Ekaluktutiak HTO 2016). Contaminants do not appear to be current threats to Dolphin and Union Caribou health (SARC 2013), but some community members voiced concern over potential future contaminants, particularly if the levels and types of contaminants grow (First Joint Meeting 2015; Second Joint Meeting 2016). Therefore, continued monitoring is important since contaminants can change as 'new' chemicals become more common, such as brominated flame retardants (PBDEs) and fluorinated compounds (Gamberg 2016).

IUCN Threat #8.3 Introduced Genetic Material (Unknown Impact)

The impact of Dolphin and Union Caribou interbreeding with other types of caribou is unknown. Some communities have observed Dolphin and Union Caribou travelling with Peary caribou, and Kugluktuk hunters have observed Dolphin and Union Caribou travelling with barren-ground caribou. Some elders report that interbreeding is occurring between Peary caribou and barren-ground caribou and that Dolphin and Union Caribou are actually the result of this interbreeding (Ekaluktutiak HTO 2016). More research is needed to understand the impacts of interbreeding for Dolphin and Union Caribou, and the implications it may have for the population.

IUCN Threat #6.1 Recreational Activities (Negligible Impact)

Concerns have been voiced over the potential impacts of tourism activities including individuals disembarking from boats or vehicles and tourists walking on caribou grounds (First Joint Meeting 2015; Second Joint Meeting 2016). These tourism activities usually take place during the summer months when caribou are widely dispersed on Victoria Island.

IUCN Threat #1.1 Housing and Urban Areas (Negligible Impact)

Human settlements are a threat because caribou that travel near human settlements are at more risk of being harvested. However, human settlements are considered to have a negligible impact because relatively few Dolphin and Union Caribou are exposed to these settlements across their range.

IUCN Threat #4.2 Utility and Service Lines (Negligible Impact)

Utilities and service lines currently have a negligible impact on Dolphin and Union Caribou, as there are very few utility and service lines in this population's range.

IUCN Threat #9.4 Garbage and Solid Waste (Impact Not Calculated)

With the successful clean-up of the DEW (Detection Early Warning) Line, garbage and solid waste was not regarded as a threat to Dolphin and Union Caribou when the threat classification table was completed. However, one community expressed concerns that garbage and solid waste should not be restricted to DEW Line sites as garbage was observed coming from the sea (Kugluktuk HTO 2016).

IUCN Threat #3.1 Oil and Gas Drilling (Impact Not Calculated)

According to one community member, in the 1970s and 1980s oil and gas exploration caused caribou to avoid their area by moving 100 miles away from all the noise (First Joint Meeting 2015). However, there is currently no oil and gas development or seismic activity occurring in the range of Dolphin and Union Caribou, and these activities are not expected within the foreseeable future.

IUCN Threat #6.2 War, Civil Unrest, and Military Exercises (Impact Not Calculated)

The time of year that military exercises occur does not overlap temporally or spatially with caribou in the area. However some community members have voiced concern over DEW-lines in this region disturbing the migration route of Dolphin and Union Caribou (Olohaktomiut HTC 2016). Despite these concerns, military exercises overall were not seen as a threat to Dolphin and Union Caribou when the threat classification table was completed.

APPENDIX B: DOLPHIN AND UNION CARIBOU MANAGEMENT FRAMEWORK

Outline of goal, objectives, approaches and actions
Based on Group Discussions in Kugluktuk: March 25 – 27, 2015; and
Cambridge Bay: January 11 – 13, 2016

MANAGEMENT GOAL/VISION:

Recognizing the ecological, cultural and economic importance of Dolphin and Union Caribou, the goal of this management plan is to maintain the long term persistence of a healthy and viable Dolphin and Union Caribou population that moves freely across its current range and provides sustainable harvest opportunities for current and future generations.

OBJECTIVES:

These are five objectives for the management of Dolphin and Union Caribou. These objectives apply broadly across the population's range in both NWT and Nunavut.

1. Adaptively co-manage Dolphin and Union Caribou using a community-based approach.

2. Communicate and exchange information on an ongoing basis between parties using a collaborative and coordinated approach.

3. Collect information to fill knowledge gaps on Dolphin and Union Caribou using IQ and TK, community monitoring and scientific methods.

4. Minimize disturbance to habitat and preserve sea ice crossings to maintain the ability of Dolphin and Union Caribou to move freely across their range.

5. Ensure management is based on population level so future generations can benefit from sustainable harvesting opportunities.

APPROACHES AND ACTIONS TO ACHIEVE THESE OBJECTIVES:

Recommended approaches (numbered as X.X.) are grouped on the following pages under each objective. More specific actions (numbered as X.X.X) are grouped below under each approach.

Objective #1:
Adaptively co-manage Dolphin and Union Caribou using a community-based approach.

1.1 Hold regular meetings with co-management partners, Indigenous governments and organizations, and local harvesting committees to make recommendations on Dolphin and Union Caribou management, and to implement these recommendations, using co-management processes and adaptive management principles.
- 1.1.1 Incorporate local knowledge, IQ and TK and ensure that plans and actions for Dolphin and Union Caribou management are informed by this knowledge.
- 1.1.2 Continue to work with wildlife management advisory boards, game councils and local HTO/HTCs on Dolphin and Union Caribou monitoring, stewardship and management.
- 1.1.3 Work with industry on best practices, mitigation, and research.
- 1.1.4 Collaborate with industry and other partners on monitoring so that information can be combined at a large spatial scale to give a big picture view.
- 1.1.5 Continue engaging hunters, industry and the public about Dolphin and Union Caribou management.
- 1.1.6 Annually review new information on population status and habitat, and adapt management practices accordingly.
- 1.1.7 Conduct regular trans-boundary meetings of Dolphin and Union Caribou co-management partners, rotating among NWT and Nunavut communities, to review information and population level and trend and discuss management.
- 1.1.8 If necessary, recommend alternative management actions (e.g., stricter habitat and/or harvest management) allowing for natural variation in numbers.
- 1.1.9 Every five years, report on management actions and progress made toward meeting objectives in the management plan.

Objective #2:
Communicate and exchange information on an ongoing basis between parties using a collaborative and coordinated approach.

2.1 Encourage flow and exchange of information between management partners, communities, industry, regulatory boards, non-governmental organizations (NGOs), and the public, using various approaches to promote better understanding of Dolphin and Union Caribou and the threats they face.
- 2.1.1 Conduct out on the land trips, where experienced hunters (elders if they're able) take youth out on the land.
- 2.1.2 Use social media and the internet to reach out to youth.

2.1.3 Conduct school visits (possibly elders if they're able) to educate youth about managing Dolphin and Union Caribou.
2.1.4 Conduct community meetings to exchange information with communities about management of Dolphin and Union Caribou.
2.1.5 Investigate possible mechanisms to foster industry participation in research and monitoring.
2.1.6 Ensure ongoing communication through supporting and improving community monitoring programs.

Objective #3:
Collect information to fill knowledge gaps on Dolphin and Union Caribou using IQ and TK, community monitoring and scientific methods.

3.1 Monitor Dolphin and Union Caribou population number, distribution and demographic indicators to determine population level and trend.
3.1.1 Expand community monitoring programs that provide information on Dolphin and Union Caribou condition, population size and trends, predators, changes in distribution, and timing of seasonal movements.
3.1.2 Develop and implement both a short and long term monitoring schedule, to monitor demographic indicators such as pregnancy, survival and recruitment rates.
3.1.3 Develop and implement a schedule to assess population status every five years, based on the framework in Section 6.6.
3.1.4 As technologies and research methods evolve, continue investigating alternative, effective methods to obtain population information.

3.2 Improve our overall understanding of Dolphin and Union Caribou health, biology and habitat requirements, diet, and effects of climate change.
3.2.1 Identify geographic areas of importance to Dolphin and Union Caribou through research and community/TK.
3.2.2 Monitor changes in predator abundance.
3.2.3 Promote research on relationships between Dolphin and Union Caribou and predators (including relatively new predators such as the grizzly bear on Victoria Island).
3.2.4 Promote research on relationships between Dolphin and Union Caribou and other species (e.g., other ungulates, geese).
3.2.5 Promote and/or continue research on Dolphin and Union Caribou population, habitat, vital rates, and health and condition, including possible contaminants.
3.2.6 Promote research on Dolphin and Union Caribou diet and vegetation growth, including changes as a result of climate change.
3.2.7 Promote research on insects and insect harassment, particularly as it relates to climate change.
3.2.8 Promote research on feasibility of alternative tools for population growth (e.g., translocation, domestication).

3.2.9 Promote research on the impacts of climate change on Dolphin and Union Caribou habitat and population.
3.2.10 Promote research on examining the impacts of road versus flight transportation on caribou.

3.3 Assess cumulative impacts on Dolphin and Union Caribou population and habitat.
3.3.1 Develop an approach to modelling cumulative effects to help predict the consequences of different anthropogenic impacts and to develop more effective mitigation measures.

3.4 Co-ordinate the gathering of information and research among different co-management partners and research institutions.
3.4.1 Identify knowledge gaps and establish high priority research questions.
3.4.2 Co-ordinate research activities with different research institutions and promote high priority research.
3.4.3 Ensure local involvement in research activities (planning, field research).
3.4.4. Promote national and international cooperation and collaboration to mitigate range-wide threats in Canada, such as climate change, pollution and contaminants.

Objective #4:
Minimize disturbance to habitat and preserve sea ice crossings to maintain the ability of Dolphin and Union Caribou to move freely across their range.

4.1 Monitor changes to habitat from anthropogenic and natural disturbances on an ongoing basis.
4.1.1 Track human and industry-caused landscape changes.
4.1.2 Monitor industrial and tourism activity including shipping traffic.
4.1.3 Track changes to sea ice and potential impacts to Dolphin and Union Caribou.

4.2 Proactively work with marine/industry/transportation organizations and regulators to minimize human and industrial disturbance and seek ways to preserve sea ice crossings.
4.2.1 Investigate mechanisms and authorities that manage shipping traffic within federal government and industry (e.g., Transport Canada) to discuss and move forward shipping concerns (e.g., amending legislation, establishing regulations including seasonal limitations for industry shipping and cruise ships during migration season, and adjusting these in response to caribou level and trend, if necessary).
4.2.2 Collaborate with federal government departments (e.g., Department of Fisheries and Oceans) to examine the potential role that marine protected areas could play in protecting the sea ice component of the migration route.

4.2.3 Develop guidelines, regulations, standard advice, and best practices for shipping, tourism and industry (including flights) that can be regulated and evaluated.
4.2.4 Monitor and evaluate compliance with (or implementation of) regulations, guidelines, standard advice, and best practices mentioned in 4.2.3.
4.2.5 Identify organizations (e.g., HTOs, NWMB, Nunavut Marine Council, and communities) who could/would play a lead role in promoting standard advice and guidelines for shipping, tourism and industry.
4.2.6 Ensure important areas for Dolphin and Union Caribou (including sea ice crossings) are brought forward in the Nunavut land-use planning process.
4.2.7 For lands in the NWT that overlap with the NWT-portion of the Dolphin and Union Caribou range, explore how a land use planning process under the IFA (s.7.82) might be used to provide greater certainty to land management while maintaining habitat for the population.
4.2.8 Bring forward Dolphin and Union Caribou concerns through Interventions in Nunavut Environmental Impact Review Board and NWT's EIRB processes.
4.2.9 Work with industry, researchers, regulators, governments, HTOs/HTCs and communities to minimize aircraft flights over Dolphin and Union Caribou areas during calving and post-calving season.
4.2.10 Work with federal-provincial-territorial committees/working groups so that Canada 2020 goals and objectives can help inform approaches to management of Dolphin and Union Caribou.

4.3 Manage populations of other species that affect Dolphin and Union Caribou habitat.
4.3.1 Promote traditional harvesting of overabundant species through subsistence and sport hunts.
4.3.2 Approach other governments to open hunting season earlier for geese.
4.3.3 Promote collection of geese eggs within communities.

Objective #5:
Ensure management is based on population level so future generations can benefit from sustainable harvesting opportunities.

5.1 Obtain accurate harvest data.
5.1.1. Increase awareness of the importance of reporting accurate and complete harvest data.
5.1.2. Work with local HTOs/HTCs and regional Wildlife Management Boards to collect accurate information on harvest levels, including submission of harvest return sheet.
5.1.3. Report estimated total harvest levels, including the number harvested and the sex ratio, to caribou co-management partners.

5.2 Manage harvesting activities within acceptable limits using adaptive management techniques included in Section 6, to ensure that harvesting opportunities are available in the future and treaty rights are fully respected.
- 5.2.1. Investigate and consider defining acceptable harvest levels appropriate for different population size and trend in the population.
- 5.2.2. Elders teach youth and less experienced hunters about wise harvesting practices that minimize negative impacts on caribou; includes no wasting of meat, harvesting only what is needed, proper marksmanship, ability to distinguish types and sex of caribou; avoid harvest of cows with calves as well as population leader; submission of samples.
- 5.2.3. Promote alternative food sources through encouraging harvest of other species.
- 5.2.4. Annually review harvest levels and make management recommendations if necessary (e.g., temporary harvest limitations).

5.3 Manage predators using adaptive management techniques included in Section 6, as a natural and necessary part of the ecosystem. (Note that establishing specific actions of a predator management program, and implementing such a program is beyond the scope of this management plan.)
- 5.3.1. Educate and train hunters about how to harvest predators.
- 5.3.2. Continue current management of predator harvesting, according to each jurisdiction's needs.

APPENDIX C: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES

A strategic environmental assessment (SEA) is conducted on all federal SARA recovery planning documents, in accordance with the Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals (Canadian Environmental Assessment Agency and Privy Council Office 2010). The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the *Federal Sustainable Development Strategy*'s (Environment Canada 2013) goals and targets.

Conservation planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that plans may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the plan itself, but are also summarized below in this statement.

It is anticipated that the activities identified in this management plan will benefit several species and the environment by promoting the conservation of Dolphin and Union Caribou. A number of species listed under SARA are present within the range of Dolphin and Union Caribou, including Peary caribou (*Rangifer tarandus pearyi*), polar bear (*Ursus maritimus*), peregrine falcon (*Falco peregrinus anatum/tundrius*), red knot (*Calidris canutus*) *islandica* and *rufa* subspecies, eskimo curlew (*Numenius borealis*), and short-eared owl (*Asio flammeus*). Species under consideration for SARA are also present in the range of Dolphin and Union Caribou and include grizzly bear (*Ursus arctos*), wolverine (*Gulo gulo*), buff-breasted sandpiper (*Tryngites subruficollis*), and red-necked phalarope (*Phalaropus lobatus*). Some species that are not listed under SARA but are considered rare include Banks Island alkali grass (*Puccinellia banksiensis*), and Drummond bluebell (*Mertensia drummondii*).

Predators to Dolphin and Union Caribou, like the Arctic wolf (*Canis lupus arctos*), may benefit from an increase in caribou populations particularly if other prey species such as muskoxen (*Ovibos moschatus*) decline. However, increases to predator populations may have adverse impacts to Dolphin and Union Caribou if their populations become very large. Conversely, a reduction in Dolphin and Union Caribou populations may have negative implications for predators. Species that share the same area with Dolphin and Union Caribou may also benefit from Dolphin and Union Caribou habitat conservation measures.

Provided conservation measures and management actions are applied, it is unlikely that the present management plan will produce significant negative effects on the Arctic environment.

This management plan will contribute to the achievement of the goals and targets of the *Federal Sustainable Development Strategy for Canada* (Environment Canada 2013). In particular, the plan directly contributes to the Government of Canada's commitment to restore populations of wildlife to healthy levels, protect natural spaces and wildlife, and protect the natural heritage of our country.